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ABSTRACT

The major resource for instructors in training for the Earlham College Wilderness Program, this manual covers the philosophy, academics, teaching methodology, and logistics of the program. It is designed as a field manual for the month-long programs (either mountaineering or canoeing) offered to Earlham students and contains information most applicable to the field situation. The manual is organized in three sections: Program Philosophy and Policy, Instructional Materials, and Logistics. The first section lists program goals, discusses the role of the instructor as participant-leader in the expedition group, and outlines specific instructor responsibilities ranging from the inspection of student gear to the communication of program philosophy. The second section contains information on group dynamics with emphasis on the stresses of the wilderness expedition; covers essential wilderness skills and safety and survival procedures; and presents background information on Western Ontario, where the Wilderness Program is conducted, including regional geology, plant and animal life, history and culture of the Ojibway Indians, and the significance of the region in the fur trading era. The final section gives detailed procedures (specific to the Earlham program) for outfitting, caravan travel, and check-in at the end of the expedition. (JH)

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Earlham College

Wilderness Program

Instructors Manual

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Edited by
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Indiana
1975

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THE MANUAL

This manual will be the major resource for instructors in training for Earlham's wilderness program. It will not be the sole source of training, but does provide a centralized collection of the philosophy, academics, teaching methodology, and logistical information appropriate to this particular program. Much of the information contained herein is useful outside of the program, such as the first aid or climbing sections. A good portion of the material, however, pertains to the Earlham course alone. Its unique philosophy, its goals and methods, and some of the logistical information fall into this category.

This volume is seen as the field manual and contains the subjects most applicable to the actual field situation. There will be additional material on campus which instructors will be expected to cover, but which will not be included in this manual.

Instructors will be expected to acquaint themselves thoroughly with the information in this manual and may be asked to take responsibility for teaching some sections to other instructors. Supplementary sessions will also be utilized to explore and work toward understanding of the information introduced in this volume.

PART I

Program Philosophy and Policy

INTRODUCTION

The Wilderness Program was conceived through five years of discussion among a number of interested faculty. In 1970 a grant proposal resulted, and the grant was funded in the amount of $100,000 to provide equipment, training of leaders, and meet other expenses attending the establishment of a program. The original grant proposal specified several goals for the program. In the years since the creation of the program, the list of purposes has grown. The Wilderness Program now attempts to achieve the following:

1. Provide adventure for students whose lives are too often those of spectators, in the hopes that real experience, and grappling directly with some of the real issues of life and survival will enlist in the students a new enthusiasm for living and a new seriousness of purpose.

2. Afford students an opportunity to improve their physical condition, and to take their bodies more seriously, as well as to regard as more important the physical side of life.

3. Give students a range of experiences designed to nourish their self-confidence, develop their initiative, increase their self-reliance, and enable them to expand their powers of judgment.

4. Provide a range of experiences through which students may be enabled to modify their attitudes about members of the opposite sex, and role stereotypes as these attach to sex, particularly to enable college men to see women as other than sex objects and to appreciate them both as human beings and as persons capable of providing leadership and instruction.

5. Give faculty advisors an opportunity to live for an extended period of time with their new advisees, to enable them to know their advisees better and thus to provide more sensible counsel during the college years, while breaking down some of the traditional authority stereotypes attached to college faculty.

6. Help orient incoming students to Earlham College, its life, purposes, and nature as a community. This is done through granting incoming students the advantages of a month of intimate acquaintance with some of their peers in the wilderness, and by providing opportunities for consideration, and comparison of life in small wilderness communities, and the expected shape of life back on campus. The intent here is to help students perceive that different forms of communities, designed to meet different objectives, impose different claims on their members.

7. Introduce students, through conversations, informal presentations, and a wilderness experience, to small group or small community dynamics, and to make students more aware of the nature of community, human interdependence, and leadership.

8. Offer to students a new model of teaching and learning, one in which students teach each other, learn from experience by trial and error and discussion afterwards, and take advantage of faculty as resource persons and as co-learners.

9. Through all of the above, give students real responsibility and leadership, and a keener capacity for judgment.

10. Open to students new interests, by turning from the wilderness experience itself to some of the academic disciplines, including natural history, botony, zoology, ecology, geology, regional history, human relations, and other areas to show how the academic disciplines can illuminate and make more clear the meaning of experience. We hope here to achieve a fuller integration of the affective, or experiential, and the cognitive.

In seeking all of the above we hope to operate within a framework in which we remember the importance of conservation in three ways. We hope to emphasize to our students the importance of conserving our human resources and their energy, our equipment, and the physical environment through which we pass. No expedition can meet its objectives if its personnel are injured, become unhealthy, or so seriously dispirited as to be unable to continue. Similarly, the success of an expedition depends in part on proper care and maintnance of its equipment, which amounts to its life support system. Students must be taught to respect their equipment as much as to respect one another. Finally, we hope to make students directly aware of the fact that all depend for their sustenance on the physical environment. To the extent that we live within it rather than transforming it, we will succeed in arriving at an accomodation in which man's dependence on the environment is made clear, and at the same time that it becomes clear that he can live within it without destroying it.

The design of the program, responsibilities of instructors, range of activities and so on, are all calculated toward the objectives mentioned above. Every feature of the program, from selection of equipment to range of activities, housing, food, the nature of the expedition's society or social setting, the organization of the groups and patrols or brigades, place high responsibilities on instructors to create a teaching and learning environment in which the program aims may best be realized. This means that instructors must be prepared not only to lead, to teach the requisite outdoor skills and academic disciplines where appropriate, but also to find ways to use the expedition's experiences themselves as primary teaching media, and to place responsibility for decision making and leadership on students as rapidly as possible. Similarly, instructors must be prepared to teach through experience as much as possible, or to allow experience itself to teach, helping students to see what the experience teaches by posing questions at appropriate times.

The Wilderness Program in the main consists of three segments, each built around particular educational and psychic goals. The program design, in order to achieve maximum educational results, includes a comprehensive manipulation of almost everything a student does during

a day. Such a scheme works best when students do not become excessively dependent on the written or spoken word as a chief means of instruction, and when they are not told very much in advance, but rather are confronted with experiences and a chance to learn from them, after which they may be encouraged to discuss and reflect on the activities completed. The first segment of the field component of the program is built around group activity, experience, and learning. In this segment students will acquire most of the wilderness skills that they need, and be exposed to most of the experiences that comprise the core of the Wilderness Program. They will do so in a setting in which they will expose themselves to weariness, pain, fear, social tension, hunger, an unfamiliar and at times dangerous environment, and to each other. Midway through the program comes solo, lasting about seventy-two hours. Solo is a time to break away from intense group action and living, to be alone, to think, perhaps to write evaluations of the program thus far. It will be most effective if students are briefed as to its possible uses. The third segment of the program blends some individualized activities and instruction with some group activities and instruction, such as more advanced climbing, "mini expeditions" without staff present, and preparation for the final expedition. During final the student members of expeditions are shuffled into new groups with designated student leaders and sent off on their own to apply all of their wilderness skills. Travel to the field is used primarily to get acquainted, to attempt to impress students with some of the goals of the program, and allow them to begin to acquire certain basic skills, such as knot tying. The return trip to campus should be devoted in substantial part to an evaluation of the program, to the completion of student written evaluations and evening discussions. These may include lessons that may be learned from participation in the Wilderness Program and applied as students enter the college back in Richmond, Indiana.

In order to succeed, instructors must be willing to be visible leaders. Faculty participants may remain largely in the background as co-participants except when called on to exercise particular kinds of expertise, although the nature of their relationship to the college must reserve to them absolute veto power to be exercised when necessary. Instructors must do most of the teaching themselves, relying primarily on experiences and activities--canoeing, hiking, setting up camp, etc. ---with a minimum of formal "classes." As far and rapidly as possible, they must designate for each patrol a day's leader, and let that patrol make its own decisions concerning its schedule for the day. As time passes leaders should travel as far as possible separately from their students, to put students on their own. They should respond more and more frequently to student questions with, "What do you think?" They should oblige students to analyze and think things out, to become dependent on themselves rather than on instructors. To the extent that instructors fail to push responsibility onto the students, they will make the students dependent and thus betray some of the most important goals of the program.

The program is designed to provide students with successes. It offers real experience, carefully conceived to provide students with slightly greater challenges each day. These challenges will oblige them to exert themselves, but they can meet them by working harder each day.

In the process they discover that they can succeed well beyond their earlier expectations, developing greater confidence in themselves. The program must be demanding. Instructors should be supportive but not overly directive and not objects of student dependence. We use weariness, fear, danger, hunger, as well as common circumstances as the experiential raw material from which students may learn. Unforeseen events, such as accidents, can also be utilized for teaching purposes. Recall the words of Henry David Thoreau in Walden:

> I went into the woods because I wished to live deliberately, to front only the essential facts of life, and see if I could not learn what it had to teach, and not when I came to die, discover that I had not lived.

All of this is a tall order. The list of staff tasks is long, for this is a twenty-four hour a day program, and we strive to make students capable of planning and executing their own expeditions, and of living comfortably and intelligently in a natural environment, all in the space of three weeks. We are to do more than Outward Bound--to provide both the experiences conducive to growth and also an understanding of how those experiences work and the techniques on which the experiences rest--and more than NOLS--teach not only wilderness skills, but also draw on academic disciplines to illuminate the experiences of the wilderness. All instructors must therefore be proficient not only in the wilderness skills normally expected and mentioned in this manual, but also in the cognitive materials that the manual contains.

INSTRUCTOR'S RESPONSIBILITIES

1. While outfitting on campus, instructors will inspect student gear, and where it is doubtful, ask students pointedly if it should be taken. They will outfit students and oblige them to inspect their expedition equipment. They will undoubtedly also find it necessary to answer student and parent questions concerning the program. They will help students with the packaging of food for expedition use, and teach students how to pack and unpack, use their sleeping bags, etc. There will be a group meeting the first evening in which program philosophy, introductions, and subject matters of general interest will be treated, but these will in no sense replace the more extensive discussions of program philosophy that will need to come later on the expeditions themselves.

2. Time in the vehicles enroute should be used to get acquainted, answer more questions, direct students to reading materials in the vehicles, and to start students working on such things as knots which will be used later in climbing.

   a. First night enroute--instruct students in tarp knots and pitching, sleeping bag placement, and cooking. A representative meal should be planned to show some of the possibilities with the food.

b. Second night--more cooking, and undoubtedly more on tarp pitching, camp-site design and so on. If time permits, this may be a good opportunity for a preliminary first aid lesson.

c. While traveling, commentary on the environments through which the caravan passes--the central low-lands, great plains, the front range, the park province of Colorado, the transition to the plateau province, and so on for the mountain trip. Various features of continental glaciation--melt water channels, dry lake beds, drumlins, moranial topography and the changing biological environments as the trip goes north for the water program.

3. Last night before entering wilderness, or first night in wilderness--a good device for breaking ice and opening students to one another is to enlist a discussion in which people explain why they are there as a means of introducing themselves to one another. It is at this point that instructors, seated conversationally around campfires, may best introduce the range of objectives of the program, and its philosophy, so as to acquaint students with the hopes to which the program is addressed, and some of the activities that they will experience during the program. It is unwise, however, to attempt to sketch out in detail the activities of each day. A degree of uncertainty is desirable, as it helps to maintain an atmosphere of freshness and novelty which will intensify the wilderness experience for students.

4. First day in the field--mountaineers will need to learn the proper way to put a pack on their backs, canoers the proper way to stow gear in their canoes. Depending on expedition, instruction will extend to footcare, walking, the mountaineer's step, rhythmic breathing, basic canoeing--water safety, map reading and orientation to land forms, and the proper organization of hiking and canoeing groups. The first evening in the field will undoubtedly see the most important instruction in fire building, campsite layout, tarp pitching, latrine construction, use, and close-up, and cooking. That evening will also see, or ought to see, the first patrol being led by a student leader for the ensuing day, during which the patrol will begin to make its own decisions concerning schedule for the next day, estimated travel time to the destination, and related matters. LEAVE LITTLE IDLE TIME.

5. Subsequent field days will see instruction in the following areas although not necessarily in the order listed.

a. More cooking including yeast and baking powder baking.

b. Emphasis on importance of eating--especially fats, and drinking, and taking unusual quantities of salt.

c. Identification of edible plants, usually by stopping when encountered, picking them and eating them.

d. Familiarization with forest plant associations and communities, lake and soil cycles/types, ecology.

e. Plant identification and animal and bird identification.

f. Rope systems, knots, signals, rappelling and climbing.

g. Drown-proofing and water safety.

h. Search and rescue

i. First aid, emergency care, and wilderness health problems.

j. Nutrition and food philosophy of the program (at resupply probably).

k. Onsite natural history and field geology.

l. Local history to illuminate human experience and how the environment affected it.

m. In every situation to invite or oblige student decision making through discussions in which group responsibility is exchanged, and through the same to nourish judgment.

n. Fishing

6. A solo, to be preceded with conversation and discussion as to its purposes and functions. These include provision of time for being alone as a counterpoint to the intense living of the first segment of the program, time for self-assessment and self-discovery, time to consider one's relationship to other people and to the physical environment, time to experience solitude, hunger, perhaps time simply to write in one's journal, time to complete notes evaluating the program to date. Conversation preceding solo might also profitably include a presentation concerning the meaning and place of wilderness in American history, thought and culture, as a means of stimulating students to begin contemplation before solo itself commences. Instructors may also wish to indicate that some students find solo useful as a time for considering the task of survival itself, and that others find it a time for spiritual growth.

7. Resupply--at resupply the expeditions comprising the program converge, offering students a time to share their experiences with participants in other expeditions. It provides a convenient point for instruction on food and nutrition. It is a convenient time to take advantage of special expertise among instructors; they can exchange classes. Resupply also offers its own peculiar problems in terms of protection of the wilderness environment by the very nature of the resupply operation.

8. Subsequent days may include peak climbs, or mini expeditions involving self-selecting groups of students. The intention of this segment of the program is to ready students for their final expeditions, filling in wherever instruction has been incomplete during the previous portions of the program, and otherwise preparing students physically, intellectually, and emotionally for the final expedition tasks.

9. Final expeditions. During the last four or five days in the field students will be reshuffled into final expedition groups whose leaders may be designated by the instructors. Final expedition groups will be expected to proceed on their own along a route that may or may not be designated by instructors to a pre-determined destination. Before embarking on their final expeditions, each expedition group will record in triplicate its proposed route and hour of arrival at final destination. The instructors will leave the field with a copy of each expedition plan, the other copies remaining in possession of expedition groups. Each group will have a copy, not only of their own plan but of those of each other group and of the leaders. While on final expedition, students normally will be expected to compile field notes, which may be undertaken jointly, or may be individual efforts. These notes may extend to a consideration of different life communities encountered and some attempt to analyze them, to more specialized studies of flora and fauna, to studies of the social dynamics at work within expedition groups, to a consideration of the history of human uses of the environments through which expeditions pass, or a consideration of conservation problems as suggested by the environments encountered. The purpose of such field notes is to oblige students to apply the cognitive learning that they have acquired in the course of the program in some systematic way as they complete their wilderness experience. What is looked at is not as important as the act of looking because if we really look for anything we are likely to see lots of other things too which would otherwise escape our notice. Instructors may also wish to require that expedition groups or their individual members complete written program evaluations as a part of the final assignment. It may be that some expedition groups will be "on survival" while completing their final expedition. Instructors might wish to make the survival final expedition a voluntary option. If students arrive at their destination before the agreed upon time they should be asked to return to the wilderness.

10. Return trip to campus. During the return trip time may be found for conversations continuing an evaluation of the program, assessing the growth that students have experienced during the course of the program, and more or less systematic reflection on the significance for individuals and for groups of their experience in the wilderness. It will also be fruitful, especially around evening campfires, to undertake discussions during which students are invited to begin to think about Earlham College as a community, and to begin to understand how and why its peculiar objectives and character as an institution of higher learning shape and inform its life. As a basis for comparison, such a discussion may fruitfully draw on the wilderness experience of a small community bent on obtaining certain goals.

TEACHING PRINCIPLES AND METHODS

Our teaching in the field draws on several guiding conceptions. One is that it is easiest to learn things that are obviously useful, although all learning involves real application. Another is that reinforcement enhances learning. Since learning may use all five senses,

the more senses involved the better. Still another is that the associating of new material with the familiar reinforces learning. A final premise is that repetition reinforces.

Instruction is especially effective when it proceeds in an organized systematic, self-assured manner. Instructors will find the following points especially helpful.

First plan your presentation carefully.

Second, offer an introduction designed to win the students' attention and deomonstrate to them their need to know what is to be taught.

Third, in your presentation, develop a learning sequence that builds on existing knowledge and experience of students and is logical. Remember to:

Speak clearly and vary voice range; do not stumble

Emphasize important points

Maintain eye-contact with group

Use instructional aids and props, and gestures

From time to time check to ensure that students understand

Fourth, provide an opportunity for practice, so that students may apply or use the material immediately while under an instructor's observation for checking purposes.

Fifth, create situations in which students must perform under actual conditions. Instructors must be present to follow up and evaluate techniques, suggest improvements, etc.

TEACHING STRATEGIES

The Wilderness Program employs many educational strategies first widely used by Outward Bound. The following is a brief listing of the most important.

The first is small group process. We use it as a means of achieving group and individual identity. Patrols and brigades are our working units within the larger structure of the expedition. Our program builds patrols or brigades as random, heterogeneous groupings whose members must both adjust to one another and to group living. These program-set goals are a further means of integrating diverse groups.

The second places responsibility for learning on the learner. Instructional staff serve as guides to pose tasks, structure and guide experiences, demonstrate activities, teach skills and substantive materials, and ensure safety. Students thus participate integrally in assessing their gains or losses.

The third is immediate application of skills. We attempt to teach knowledge or skills in a manner that allows their application in some activity or task as soon as possible after instruction.

The fourth, as is noted in our introduction, is graduated challenges. We use successively more difficult challenges to establish a pattern of success earned through increasing efforts, allowing a growing sense of achievement.

The fifth is use of a simplified environment as an effective, impartial teacher distributing immediate, impartial, appropriate consequences for student behavior, responsible or otherwise. Failures to construct shelter, build a fire, and so on, for example, have direct and observable results.

The sixth is use of 24-hour a day programming. We provide an intensive experience involving confrontation with environment, self, and others continuously, around the clock. Unrelieved stress, group shared experience, and the tensions of close living in demanding circumstances, the juxtaposition of hot/cold, dry/wet, tired/rested, exalted/bored, together/alone, and so on all help to sharpen perceptions.

The seventh is use of a "performance-centered" guidance approach. We assume that persons feel better after they do better. We try to do first and consider feelings about self and others afterwards, all in a way that will encourage a sense of achievement and an enhanced self-image.

LEADERSHIP AND DECISION MAKING: LEADER AND GROUP RESPONSIBILITY

One of the major goals of the Wilderness Program is to make students aware of the nature of leadership, and to oblige them to accept increasing amounts of responsibility. One of our key devices for reaching these ends is to create a framework within which leadership of a patrol or camping unit changes each day, so that each member of these groups becomes leader for at least one day in the course of an expedition. Instructors may designate the next day's leader after the group has reached its campsite for the evening. It is also possible for the group to choose its leader each day. That leader is responsible for arranging a meeting of his group, to consider together plans for the next day, scheduling, and other matters related to reaching the destination the instructor has announced for that day. The day's leader is responsible for designating different roles for members of hiking and canoeing groups and ensuring that the group proceeds on schedule. He is also responsible for the decisions the group makes during his day of leadership, whether he has himself participated in those decisions or not. It is expected that most of the time patrols will move in the absence of instructors, who normally will have gone ahead, or elected to remain behind, so as to oblige the group to move on its own. Where the day's route involved particular dangers, instructors may wish to stay only a bit ahead, or a bit behind the hiking group, close enough to keep in touch, but far enough away so as not to be visible to the members of the hiking

group. The logistics of seats in canoes normally makes it impossible for the instructors to be separate from their brigade.

In discussion of the reasons for which leadership rotates in hiking groups, instructors should make it clear that an expedition is a single unit or group. It depends for its success on the wholehearted cooperation of all of its members, upon the assumption of responsibilities by all of its members. If one member slacks off, or fails to do his share, the entire group suffers as a result. Slow starting on the part of one person may result in the arrival of the entire group at its day's destination long after dark, to the inconvenience, and perhaps to the danger of all. This lesson is of utmost importance, and instructors may find it necessary from time to time to dressdown students who are lax in their habits or practices, or to have private consultations with the day's leader or other members of the patrol, so that the patrol itself will exert pressure on lax members. In event of injury, sickness, or other mishaps, the instructor again must appeal to the collective responsibility of the expedition. If students fail to see that they must depend upon one another to act responsibly in the wilderness, the result will be to add unnecessarily to the risks and to the discomforts that all will experience while in the field. In some instances these risks may extend to life and limb. It is not possible to over-emphasize the importance of these considerations.

In working with students, instructors may find it desirable at intervals to have group discussion in the evening, during which the events of the day, the decisions that the group has made, and other salient matters may be considered. It is at this point that the quality of leadership may be evaluated frankly. The means by which groups have made decisions, the operation of different personalities and judgment factors, should all be exposed and examined with good will, but honestly. Through such discussion students may more fully recognize their dependence on one another, and come to appreciate more fully that an expedition is a small community whose members are to an unusual degree immediately dependent upon one another. In such discussion, also, students may come more readily to see what judgment is, and how good judgment may contribute to the well-being of an expedition.

Where mishaps occur, they should be utilized for teaching purposes. A sickness, injury, or some other mishap is an invitation to serious discussion. But, depending upon the immediate circumstances, such discussion may have to come sometime after action has been taken to meet the situation at hand. It would be fruitless to discuss a crisis while someone was bleeding to death. Instructors should also recognize that anger is sometimes a useful device for getting the attention of people, or for raising their level of involvement in a particular enterprise. If a student or a patrol should do something particularly dangerous or stupid, instructors should not feel that they may not get mad. In fact it may be to the good of all concerned if instructors do get angry, and then after their anger has subsided use that anger as a device for stimulating a consideration of its causes.

GROUP PROBLEM SOLVING TECHNIQUES

The following guidelines may be used to help patrols, brigades, and individuals to deal with nearly every problem, from a refusal to participate to the completion of group tasks.

It must be remembered that creating an atmosphere conducive to effective problem-solving is of utmost importance. In such an atmosphere, interpersonal stress should be lessened. It is fruitless to attempt to fix blame or to try and put down another's suggestions. Only a supportive atmosphere in which people feel comfortable offering tentative suggestions is conducive to effective group process.

First, and most important, define the problem. State it in terms all can understand. What needs to be done? What is happening that shouldn't? How is the problem important? Make sure all concerned understand. And ensure that the problem is resolvable with available personnel and resources before you tackle it. To reach too far is to invite failure. In proceeding, do not rely too much on generalizations, abstractions, or hair splitting. Keep on the subject.

Second, gather the information you need to deal with the problem. Invite the group to contribute. Try to minimize the role of unsupported feelings, lethargy, premature conclusions, and domination of discussion by one or two outspoken persons.

Third, identify alternatives. If the problem is clearly stated, something will be offered. Avoid grabbing solutions too quickly. Invite as many as possible--brainstorming without making immediate judgments on suggestions is a good way to get things going. Finally summarize them and encourage consideration of each in terms of its consequences. Employ a questioning technique. Avoid identifying solutions with persons, sidetracking arguments, and overanalysis.

Fourth, test alternatives for workability - consider implication and through discussion seek group commitment to a best course. Remember that inexperience can make it difficult to predict outcomes. Avoid polarization or bulldozing, and seek consensus rather than the imposition of majority opinion.

Last, act, once the group has determined on a course, pinning down responsibility and providing for adequate checks and follow-up procedures. Hold everyone to a commitment. It is imperative to set responsibility and allow no backsliding.

PERSONAL EQUALITY

As the introduction to this manual notes, most of the visible leadership and instruction of the program is to come from student instructors. At the same time faculty instructors, by virtue of the different nature of their connection with the college, do have certain responsibilities that override those of student instructors. Where there is danger to life and limb, or to the well-being of an expedi-

tion, it may at times become necessary for faculty leaders to overrule student instructors. As far as possible, faculty and student instructors should arrive at decisions through collective, and private, discussions. It would be most unfortunate for instructors, in ordinary circumstances, to engage in open disagreement with one another.

The morale of the members of the expedition will depend on the maintenance of a common standard of living among all of the expedition members. Thus, faculty instructors are expected to use the same equipment as the students and eat the same rations. Of course, instructors may wish to carry cameras, extra books, extra food that serves as treats to be shared with all members of an expedition, or certain personal fishing and other specialized gear. But this gear should not look appreciably different from that issued to students, or, if it does, instructors should be prepared to justify their use of it in light of the overriding concern for the morale of the group.

BEHAVIORAL STANDARDS AND EXPECTATIONS

The Wilderness Program is a part of the larger program of Earlham College. Instructors and participants in the program are bound by the same standards that obtain for the larger college community, as well as some special standards that attach to the Wilderness Program itself. Both full-time faculty and student instructors, who are also employees of the College while discharging their responsibilities on expedition, will be expected to maintain standards of conduct which set an appropriate example for their expeditions. In addition, student instructors as the visible leaders of expeditions have direct responsibilities for the maintenance of appropriate standards among students participating in the Wilderness Program.

As a part of the curriculum of the College, the Wilderness Program sustains the standards of the College. Even though individual faculty and student instructors may disagree personally with some of those testimonies, they will be expected to implement the testimonies to the same extent that they are enforced on campus. Where instructors do differ with testimonies, and where they encounter students who question them, there will arise opportunities for fruitful discussion of the obligations that membership in a community imposes.

Since the Wilderness Program has certain objectives that are peculiar to itself, it adds its own expectations to college standards in some instances, and in other instances it restates more forcefully college positions. The maintenance of the morale and sense of responsibility of an expedition are not compatible with dishonesty, unreliability in the discharge of responsibility, selfishness, or sexual license. Beyond these lies the intent of the program to invite students to live with great intensity, vigor, and zest, to live elementally. We hope to encourage them to do so through an experience which obliges them to confront themselves and the wilderness, and in gaining respect for themselves and per-

ceiving a need for cooperation to respect one another. In order to allow this confrontation to be as rich as possible, we emphasize the importance of leaving behind as many as possible of the diversions, needless comforts, and artificial emotional props that our culture provides. Thus we add to or emphasize college testimonies at our group meeting on outfitting night by informing students that from the moment they check in they are on expedition. We say something of the nature of the expedition experience, something of our aims as here cited, and offer the injunction that for the duration of the expedition there will be no use of psychoactive drugs, tobacco, or alcohol. Students who do not feel that they can abide by these standards are asked to withdraw from the program at that point, as are those who may feel unable to complete program activities. All participants are informed that a violation of these expectations will result in their immediate evacuation from the field site to a roadhead, from which they must make their own way either home or to campus.

There is slight likelihood that students will willfully violate any of these expectations. Instructors, however, should recognize that the possibility exists, and that where it materializes they will be responsible for the implementation of the policy here described. It is possible to reduce the likelihood of student failure to meet behavioral expectations by introducing into conversations from time to time pertinent comments. Above all we need to avoid preaching. There are sound and substantial reasons for maintaining the standards that we attempt to uphold. Some of them have been noted above--1) a recognition that membership in a community involves meeting the standards of that community, and trying to understand the role of standards in defining and maintaining a community, 2) a recognition that we may be better able to confront the environment and ourselves if we can divorce ourselves from chemical and other artificial props, 3) a recognition that the exploitation of persons or introduction of behavior that affronts the morality of members of an expedition can do nothing but damage the morale and sense of collective responsibility of an expedition group, 4) sure knowledge that, for example, alcohol and drugs and to an extent tobacco, affect in serious ways the physical efficiency of the human body, and that the bodies of members on expedition must be maintained at peak efficiency if the expeditions are to attain their objectives.

If instructors cannot in conscience uphold the standards noted, then it is difficult to see how they can constructively associate themselves with the Wilderness Program, and they may be invited to withdraw from it.

WILDERNESS PROGRAM AS COEDUCATION

From its beginning, the Wilderness Program has been coeducational in design and nature. The planners of the program chose this course only after careful thought. They consulted with and trained at Outward Bound schools, the administrators of Prescott College's orientation program, and the National Outdoor Leadership School at Lander,

Wyoming. They recognized that Outward Bound, until recently, offered no coeducational courses. Prescott College, which drew on Outward Bound for staff and philosophy, maintained separate orientation expeditions for men and for women, although students might themselves organize coeducational expeditions after entering the college. The National Outdoor Leadership School, in contrast, has for several years offered coeducational courses, and the coeducational dimension of those courses has extended right down to the organization of tenting and cook groups of two persons each. In addition, of course, there was Earlham's own experience in field work to draw upon. For some years, both the geology and biology departments had run field trips that were coeducational in nature. The task of the program planners was to draw together from these various sources ideas that would provide an educational grounding for a coeducational wilderness program.

Extensive discussions resulted in a number of decisions concerning coeducation. The first was that the Wilderness Program itself ought to be coeducational, for the following reasons: (1) Many, if not all, entering students and a good many upperclass students have had no contact with the opposite sex outside a courtship relationship. We hope to provide them with a living situation that eliminates adolescent courtship/sexual patterns and thus, by reducing the probability of defining relationships as sexual, encouranges the development of relationships on a mature, human basis. (2) We rely heavily on the use of instructors of both sexes to help break down stereotyped sexual roles and encourage students to perceive that persons of both sexes possess strength and weakness, the capacity for good and bad judgment, and qualities of leadership and responsibility. (3) We believe that a coeducational expedition is more likely than a sexually segregated program to provide a situation in which students are encouraged to develop responsible attitudes and internal controls governing their behavior. (4) In this connection we perceive that a coeducational program is an effective means -- judging from student comments and what we have observed -- to help students come to regard one another as human beings rather than sex objects. (5) We also expect through a coeducational program to provide an opportunity for students to develop a respect for one another's privacy based on an understanding of human needs and preferences rather than institutional strictures. (6) Finally, we anticipate that the coeducational feature of the program will introduce yet additional tension and adjustments into an experience in which these are to be vital components.

Given these reasons, we decided that the program would be coeducational from its staff arrangements through living and cook group assignments. That is, individual tarp and cook groups of two or three persons each could and would be coeducational if circumstances warranted. We envisioned that students would, after being randomly assigned to patrol groups (but with some attention to balancing out numbers of persons from both sexes, and balancing upperclass and entering students) be assigned membership in tarp-cook groups in the random order in which they checked through and outfitted on the initial day of the expedition. This was to make coeducational

living appear to be as natural and efficient a routine as possible. At the same time, it is necessary to recall that there may be instances in which parental or student objections are so great, or so deep, that an exception must be made. Instructors, then, are left to exercise their own judgment about which procedure is best. But they should be mindful of both the opportunities and the pitfalls inherent in each. The object is to create an optimally effective learning situation, and the creation of needless conflict or destructive anxiety would contradict that goal. The Wilderness Program uses tension and anxiety, but only when these can be bent to educational purposes.

STUDENT JOURNALS AND PROGRAM EVALUATION

All students should be encouraged to have a journal of their thoughts, activities, and impressions while on the program. If they do not have writing materials of their own, students may pick them up on outfitting day. This exercise can be useful as a means of obliging students to think seriously and systematically about their wilderness experience, and thus to gain from it as much growth as possible. Journals ought also to contain program evaluations, both interim (completed while on solo) and final, (completed either on final expedition or while on the return trip to campus and turned in before campus is reached). These evaluations may be separated from the bulk of the journal for program files, or read as part of the journal by instructors. The journal, if the instructor reads it as Outward Bound recommends, ought to be conceived of as a confidential exchange between student and instructor, and its reading the end of a process of confidence and mutual trust-building. The reading of journals by instructors is not required, but may be useful as a learning tool. It should be made clear to students from the beginning, however, that they will be read, if that is the instructor's decision. So used, journals can help instructors guage both the program and the progress of students, and students to guage themselves.

PHYSICAL EXAMINATIONS AND CONDITIONING

The Wilderness Program does not require physical examinations of its participants for two reasons. 1) The assumption that any person who really wants to go on an expedition is likely to be able to find a physician who will sign a form certifying that he is fit to participate, whether he really is or not. 2) It is a demonstration that enjoyment of the wilderness is not limited to tough he-man types but is open to almost everyone. It is in this context that we oblige all participants to sign waiver of liability forms. It is also in this context that we assume that our participants are in general not physically prepared for the rigors of an expedition experience, and that even if we could oblige some to become prepared others would not, requiring expeditions to gear themselves to their weakest members in any case. We adapt the life of an expedition to these assumptions about physical condition of its members, and attempt as rapidly as possible, by means of increasingly strenuous activity each day, to

toughen participants as the expedition progresses. Normally it takes anywhere from four to eight days for people to become reasonably hard in the wilderness. After they have become hard, they may engage in quite strenuous activity each day.

Where students have particular health problems, as far as possible we expect them to take precautionary measures themselves. For example, if a student is diabetic, he will be responsible for his own medication. The same holds true for students who may be allergic to bee or wasp stings. Our instructors will be trained to administer intramuscular injections of medicines, but we cannot be expected to provide trained medical or paramedical personnel, and it must be clearly understood what the students' health responsibilities are. Instructors should talk to his/her group about special medical problems and be sure to know, as best as possible, about any special problems. If people seem reluctant to talk about problems in a group, it would be wise to take the time to discuss the matter individually.

PART II

Instructional Materials

Wilderness Program Group Dynamics

by Dale Noyd & Alan Kesselheim

Wilderness program instructors must be concerned with the group process. The program structure makes for an intensity of the small group process seldom encountered in life. The people are in contact with each other 24 hours a day for 3 to 4 weeks with the exception of solo. When things become tense you can't walk out of the coffee shop or wait for the class to end. Problems must be dealt with. In one sense, this prospect can be quite awesome, but in another, it provides the setting for a great deal of personal growth.

The dynamics listed here will allow instructors to be more aware of some of the fundamental phenomenon occurring in a group.

I. Wilderness Program Chronology:

A group on the program will typically progress through several broad steps of development throughout the course. The length of time spent in each step and the intensity of problems encountered along the way will vary from group to group.

1) Getting acquainted: This stage may last as long as a week. It is here that group members break the ice, evaluate each other's strengths and weaknesses, and establish group roles. Initially there will be a fair amount of uncomfortableness as a group feels its way through this stage. A leader can be useful here by providing situations in which people may talk comfortably and get to know each other.

2) Group role sets: The second stage in group development involves the setting of individual roles within a group. Members identified as leaders or followers, physically strong or weak, good with words, quiet, etc. will be fitted into roles that coincide with group expectations. There may be some tension involved in this process and discussions may be profitable in order for people to get things off their chests. Leaders should be very aware of what is happening at this stage.

3) Personal conflict: Later in the program people may get tired of being so close to each other all the time and other member's idiosyncracies may get on people's nerves. At this stage the group is ripe for fights and general bickering, especially in stressful situations or when decisions must be made. Here it is important to allow for constructive outlets of feeling and to allow people to have private time when they don't have to worry about others.

4) Let down: The drive back to campus is often a let down for students. They are out of the wilderness, confronted again with society, and may become preoccupied with their own thoughts and problems. The group as a result may become anxious and preoccupied. To an extent, it is fine at this point for members to feel that the pressure and responsibility is somewhat relaxed, but the program is not over and there are activities which can be beneficial on the drive back. It may be used for a general program debriefing in which people think about the program as a whole and its significance. It can also be used as a time for orientation for freshman who will undoubtedly have college much on their minds.

II. Specific Dynamics

1) Leading vs. Following: In every group there will be both leaders and followers. The structure may vary from task to task, depending on the relative strengths and weaknesses of group members. As the group develops, members will come to expect leadership from certain individuals at certain times and followership from other individuals at other times. The important thing in terms of group efficiency is that the group, over time, comes to agree on where the leadership lies.

2) Conflict over Expression of Feeling: In any group there will be those who wish for free, frank and uninhibited expression of feelings and others who rank along the continuum all the way to withdrawal from the group. It is necessary to provide some outlet for expression of feelings, comments and gripes. This might take the form of a daily group meeting. The group will have to work out the degree of openness allowed. Again, the important thing is that the group agrees on this.

3) Conflict over Relative Emphasis on Group and Individual Purposes: This conflict is crucial on the wilderness where group cooperation is vital for an efficient and safe course. At times there will be students who are more concerned with themselves and are quite reluctant to contribute to the group process. The optimum situation is to have an efficient cooperating group that allows its individual members the freedom to be themselves. The balance between group goals and individual desires is difficult to strike and will take some time, but it is perhaps the most important consideration.

4) Fighting

Some ways the fight might be expressed:

A) members are impatient with each other
B) ideas are attacked before completely expressed
C) members take sides and won't compromise
D) members disagree on plans or suggestions
E) comments are made with great vehemence
F) members attack each other on a personal level in subtle ways
G) members insist the group can't work for various reasons
H) members disagree with the leader's suggestions
I) members accuse each other of not understanding the point
J) members hear distorted fragments of other member's contributions

Possible reasons for such behavior:

A) The group has been given an impossible task. The task may be physically too difficult or too ambiguous in nature. Whatever the reason, frustration and tension may turn into bickering and fighting.

B) The main concern of members is to find status in the group. Some or all members may be jockeying for power or trying to establish alliances. All of this detracts from effective problem-solving and may become dangerous.

C) Members feel involved and are working hard on a problem. Members may express impatience, irritation, or disagreement because they have a real stake in the issue. They fight for a plan because it is important to them - and this fight may take the form of real irritation with others because they can't "see" or won't go along with a suggestion which - to the member - is obviously the best one. As long as there is a clearly understood goal and continuing movement on a problem, this kind of fight contributes to good problem-solving.

5) Decision-making difficulty: Sometimes a group has a hard time making decisions. This could be a manifestation of many phenomenon. A few of the more common causes are listed below.

A) Fear of consequences: A productive group will weigh the consequences of a decision, but in an insecure group this may just bring division and disagreement, stagnating the decision-making process. Also, some members may not wish to step out of comfortable modes of behavior and try something new. Sometimes failure to make a good decision may be traced to poor preparation of the group to deal with a problem.

B) Interpersonal conflict: This conflict works against problem-solving efficiency because it complicates the process by bringing in personal conflict. In such a situation, members may support or disagree with proposals on the basis of liking or disliking another member rather than on the merits of the proposals. Conflict will be partly logical and partly emotional. The group must come to accept difference of opinion conflict and to recognize more destructive interpersonal hostility. If there is one member of the group who is relatively free of personal prejudice, he or she can be very helpful in guiding a group towards solution of this problem.

C) Methodological blundering: Conflict may arise at any of three stages of problem-solving. The presentation of the problem is not clear; the knowledge of the options, and basis for weighing their relative merits is not available; or decision making processes may fail. This may arise when some member of the group are not sensitive to the feelings of others. Instructors need to be careful to prepare presentations efficiently and avoid ambiguity when possible.

D) Inadequate leadership: A good leader should guide a group, but not coerce members in a certain direction. This guiding may take the form of simply providing a learning situation and stepping out of the picture. A good leader needs to develop a certain amount of detachment from the group so that he/she doesn't get his/her ego all wrapped up in the process.

6) Feedback: Groups need constant feedback in order to keep track of goals and progress towards those goals. On our program the feedback may be received in impromptu discussions either scheduled or spontaneous as well as by other more subtle methods. The leader should be alert to subtle feedback as it comes up during the day. The leader may be in the best position to collect this information, but all members should be asked to be sensitive to the group process and to bring up their observations to the rest of the group.

Members should be especially aware of what the group goals are and what methods will be used to reach those goals. This is not to say that goals and methods are static. The group is a process and the feedback emphasis stresses the process of change and adjustment within a group.

ORGANIZATION OF THE HIKING GROUP

As groups set out for their first day's hike, it will be important to establish a normal hiking order. At the front of each hiking group should be a scout whose task it will be to check the route and find the way. This is especially pertinent on days when the group is bushwacking. The scout may be out one or two hundred years ahead of the group, but should be in its view. Next in the order of march should be a person whose job is to smooth the way, designated as the group leader, eliminating the zigs and zags in the scout's route. The group will follow, in single file. At the rear should be an end man, whose job it is to make sure the entire hiking unit stays together and arrives at its destination safely. The end man is in the best position to determine whether people are having difficulty and he should be prepared to act accordingly. If a different student is placed in charge of map reading for each day, each student has a chance to apply map reading instruction to actual hiking conditions.

During the first trail day, instructors might wish to hike behind the end man so as to observe the entire patrol. It should be emphasized that every member of the hiking group ought to be able to see the person ahead of him and the person behind him at all times. A patrol should never become so widely separated that its members cannot see one another. Neither should it hike so close that everyone chokes in dust or stumbles over everyone else.

At the start of each rest stop the day's leader should announce how long it will last and whether it will be "packs on" or "packs off," depending on the length. He should give a 3-5 minute warning before a rest ends and get the group moving promptly on schedule at the end of each stop.

Instructors will also emphasize that under no circumstances are parties of fewer than three or preferably four to undertake a hike on their own at any time. When doing so, such parties should file in writing an exact description of the route they propose to take, indicating the route on a map as well. Such hiking groups should

carry with them exact duplication of the itineraries and marked maps that have been filed with instructors. There is to be no solo hiking whatever. The reasons for this may be made clear to the group through a discussion of accident risks and safe ways to care for an injured person while getting word back to an expedition. Students will see that at least one person needs to stay with an injured person, while two go and inform the expedition.

FOOT CARE AND HIKING TECHNIQUES-STREAM CROSSING

Another important task of instructors, during the first trail day, is to teach care of the feet and hiking technique. It will be necessary for instructors to get patrols into the habit of checking among their members to see whether hot spots or blisters are developing. At the first hint of a hot spot or rubbing on anyone's foot, the patrol should stop. The persons whose feet hurt should remove one or both boots as the case may be and an instructor should demonstrate the proper application of moleskin to protect the tender area. It would also be useful to place tape over the moleskin to provide an additional margin of protection. Some students who note that their feet are tender may wish to tape their feet preventively before they even begin to hike.

It will also be necessary to check, from time to time, to ensure that boots are properly laced and tied. If they are too loose or too tight the result will be painful blisters. Students should also learn that a helpful device for toughening feet is to soak them in ice-cold streams or lakes at the end of the day. But they should also learn that it is not wise to remove boots for an extended period of time before the day's hike is completed. If boots are removed for a long period of time in the middle of the day, the feet will swell, and one result may be greater injury to feet.

In addition to observing the above, instructors should watch their students and teach them rhythmic breathing. The principle here is that oxygen intake should be balanced with oxygen expenditure as the muscles work. Depending on the steepness of the slope it may be necessary to take as many as two breaths per step, one breath per step, or even four steps per single breath. Students should learn to balance rhythmic breathing with variations of pace. They should learn as well that it is important to maintain a steady rhythm in walking, rather than darting ahead or pushing too hard. The price for pushing too hard is excessive fatigue.

Stream crossings encountered in normal hiking provide students with opportunities to develop judgment. It may be desirable to invite a patrol to consider proper methods of crossing streams when the first major stream crossing is reached. If discussion does not precede the first stream crossing, then it should follow it, so that students will become aware of standard safety practices.

Students are to learn that prior to crossing streams, whether on logs, down wood, or wading, they should unfasten the waist belts of their packs. This is done so that in case a student falls he can get out of his pack. In addition, students learn that before wading streams they will do one of the following: 1) remove their boots and stockings, and then replace their boots on their bare feet after placing stockings in packs or elsewhere to keep them dry, tie their boots, and wade the stream in boots only. After crossing the stream, they will remove their boots, empty the water from them and wipe them dry with a bandana or some other piece of cloth. Stockings may then be replaced and boots put back on. Heat from the feet, together with the absorbent qualities of the stockings, will ensure that the boots dry properly, while they more nearly assume the shape of the feet of the wearer; 2) or they will wade streams in their tennis shoes, again without stockings. It should also be emphasized that the rigid support boots provide is often far more desirable than the kind of support provided by tennis shoes. Under no circumstances are students ever to wade streams barefooted. They should be reminded that boots and shoes can be repaired and replaced, but the only things that can be done with a student who has foolishly injured his feet is to evacuate him from the mountains, at considerable expense to the success of the expedition.

Instructors will wish to teach much of the above in the course of hiking, using situations as they develop. For example, a patrol that starts out too rapidly will become tired, or individual hikers may become fatigued or exhibit other problems. An instructor could deal with these conditions as they arise and invite either group or individual discussion for figuring out a better way to do things.

Instructors should also teach the mountaineers' step. The front foot is swung forward and planted on the ground, knee is locked and body swung ahead on a straight leg while the other foot is brought forward to repeat the operation. Feet are to be put down softly and on flat solid surfaces, not on the tops of small rocks that might cause a fall or injury. These procedures reduce muscle fatigue and conserve energy.

CANOEING AND WATER SAFETY TECHNIQUES

by Henry Merrill

I. Entering Canoe:
   A. A canoe should not be bridged, (i.e. supported at both ends but not in the middle) on shore when loading or entering it.
   B. One person always stablizes a canoe while another enters.
   C. When stepping into canoe place weight (foot) in center on keel plate.
      1. Keep center of balance low by stooping.
      2. Maintain balance by placing hands on gunwales.
   D. Only one person should be moving in a canoe at a time.

II. Paddle Strokes (all directions given as if paddling on right side):
   A. General techniques:
      1. The power of the stroke is provided by the top hand driving the paddle down into the water.
      2. The bottom hand is close to the blade of the paddle, arm stays relatively straight.
      3. The bottom hand serves as pivot point of the paddle and does most of the work in feathering (i.e. turning the paddle so the thin edge is the leading surface rather than the broad side) and returning the paddle forward in preparation for next stroke.
      4. Paddle should travel in a plane parallel to the direction of the canoe and be approximately perpendicular to the side of the canoe.
      5. During the stroke the paddler should keep his weight centered in the canoe and NOT lean towards the side on which he is paddling.
         a. The change in weight distribution when a paddler leans makes it harder for the others in the canoe to execute their strokes. It also rocks the canoe which increases the friction of the water thereby slowing the movement.
   B. Stern strokes (steering as well as power);
      1. J-stroke: a) Pivot with wrist and elbow so thumb of top hand points down. This turns blade of paddle from perpendicular to parallel with canoe.
         b) lower hand pushes paddle away from canoe.
         c) Turns canoe to right.
         d) Best time to practice is when solo canoeing. If you can maintain a straight line without changing sides your J-stroke is probably pretty good.
      2. Stern Sweep: Turns canoe to left.
         a. Paddle held at an angle to canoe, away from side, rather than being perpendicular to water.
         b. Paddle is drawn through water in an arc pushing water under stern of canoe.

3. Reverse stern sweep: Turns canoe sharply to right.
   a. Top of paddle placed in small of back.
   b. Top hand grips gunwale for balance.
   c. Pull paddle forward with bottom hand.

C. Bow strokes:
   1. Straight power stroke:
      a. Reach forward with paddle as far as comfortable.
      b. Top hand drives paddle into water.
      c. Paddle pivots in lower hand. Stroke continues until paddle comes to surface behind paddler.
      d. Lower hand feathers paddle and moves it forward into position for next stroke.
   2. Bow draw: Draws canoe bow to right.
      a. Paddler reaches out with paddle at approximately a right angle to direction of canoe's travel, drives paddle in water and draws paddle towards him.
      b. Paddle is feathered out of water to right away from canoe.
   3. Cross bow draw: Draws canoe bow to left.
      a. Cross draw is accomplished by paddling on opposite side without changing position of hands on paddle. In this example by reaching over to left side of canoe to draw bow in that direction.
      b. Top hand will end up against chest or left shoulder and paddle will be almost parallel to water in between strokes.
   4. Bow rudder: Steers canoe bow to right.
      a. Top hand holds paddle against chest or shoulder.
      b. Bottom hand, with arm extended out in front, holds paddle in water with blade perpendicular to water causing it to act like a rudder.
   5. Cross bow rudder: Steers canoe bow to left.
      a. The paddle is in same position as bow rudder but on opposite side of canoe again without changing position of hands.

D. Middleman stroke:
   1. Same straight power stroke as bow man (II, C, 1.).
   2. Usually paddles on same side as bow man.

E. Courtesy and responsibilities in a canoe:
   1. Bow man: Does NOT steer except:
      a. to avoid obstacles the stern man cannot see
      b. on winding streams
      c. on whitewater
         1) Is responsible for warning stern man of obstacles and telling him which way seems best to steer to avoid them.
         2) Is responsible for navigation (unless there is a middle man).
         3) Is responsible for setting and maintaining beat.
            a) The beat is an even rhythm of strokes.
            b) The beat is a matter of individual preference which should be worked out between all paddling in the canoe.
            c) A long, slow beat provides maximum power per stroke and, is least tiring over the long haul. It also gives the stern man the most time to complete steering strokes and recover.

4) Is responsible for calling changes of side at comfortable intervals upon which he and fellow paddlers have agreed.

2. Middle man:
   a. Sits on pack or kneels just aft of carry yoke, but does not sit on the carry yoke.
   b. Is navigator (plots course on map, identifies landmarks, points way for stern man to steer).
   c. Must try not to lean to the side on which he's paddling. This is difficult because being at the widest part of the canoe he has the farthest to reach when paddling.
   d. Follows beat set by bow man. If he wants to alter the beat or change sides he should ask bow man for a change.
3. Stern man:
   a. is responsible for steering course pointed by navigator.
   b. Follows beat set by bow man. If he wants to alter the beat or change sides he should ask bow man for a change.
4. Encourage cooperative, courteous attitude:
   Paddling or portaging a canoe is a task which requires cooperation of a very high degree between those involved in the task. It also means that each person needs to work all the time. This is true of all wilderness tasks but the stresses are readily developed and visible in a group canoeing together. The key to fostering cooperation is to encourage from the start open and courteous exchange about how to share the burdens to get the task completed. This will need to be talked about from time to time.

III. Exiting and Efficient Portaging

A. Bow man exits first upon landing. Stern man keeps canoe in position and stable for bow man's exit.
B. Bow man then steadies canoe between his knees for middle man to get a pack out and exit. Middle man starts portage as soon as his help is no longer necessary to bow or stern man.
C. Bow man continues steadying canoe while stern man gets other pack out for bow man to carry across portage.
D. Stern man exits.
E. Bow man starts across portage as soon as stern man no longer needs his help with canoe.
F. Stern man carries canoe across portage.
G. At start of next paddle, positions are rotated so all get equal experience in paddling positions and portaging tasks:
   1. Bow man goes to stern position.
   2. Stern man goes to middle position.
   3. Middle man goes to bow position.

IV. Changing Positions in a Canoe Away from Shore

A. Hazardous but possible. Should be taught when doing canoe rescue techniques.
B. The sequence of people moving is talked out before anyone moves so all know exactly what's going to happen.

C. Only one person moves at a time.
D. Anyone not moving centers the balance as low as possible by kneeling low in the bottom of the canoe.
E. The person moving gets to his pre-arranged place by creeping over the top of other persons placing hands and feet on gunwales.
F. Each person moves in this manner, one at a time, until all are in new positions.

V. Notes on Whitewater Canoeing
A. Always look for a portage.
1. If there is one which shows signs of use it is there for a purpose.
2. At least at certain times of the year the rapids are impassable.
3. Determine whether or not the rapids are safely passable before deciding to run them.
B. Approach the river bank well above rapids to look for the portage, keeping close to the bank to avoid dangerous currents.
1. Outside canoe, the one closest to middle of river, lands first.
2. Other canoes remain behind, close to shore and well apart, until there is room for them to land.
C. Walk the full length of the rapids to study (read) them before deciding to run them. Read the currents around and over obstacles by throwing logs into the river above the rapids and watch their progress through the rapids.
D. Plan a route through the rapids with the partner in the canoe so both are working together.
E. Always portage the packs. Never run rapids with anything loose in the canoe.
F. Always wear life jackets when running rapids. Put them on while on shore, before entering canoe.
G. Kneel in bottom of canoe while running rapids to keep center of balance low.
H. In general, keep to center of chute and keep canoe pointed in direction of current. Do not get bow of canoe caught in slower backwater (which occurs on downstream side of an obstacle) or canoe will spin around because the stern will be in faster water.
I. Always paddle faster than current or hold water so canoe is going slower than current to keep canoe under control.
J. If cutting across current always paddle on the upstream side so canoe is not driven by the current over the paddles. If this happens the paddles could break or the canoe could go over.
K. Paddling upstream a zig-zag course across current is necessary. Turning is most easily accomplished in the backwaters behind obstacles.

VI. Canoeing in bad weather.

A. In a thunder storm get out of the canoe and take it out of the water. Aluminum is one of the best conductors of electricity known.

B. In high winds try to avoid being broadside to the wind and waves, and wear life jackets.

CANOE RESCUE TECHNIQUES

by Henry Merrill

A. Always use an empty canoe when teaching canoe rescue techniques. This means paddles have to be cleared to another canoe not working at the moment.

B. Exiting canoe (safely):
   1. Exit vault:
      a. First agree who's going first and on which side. If exiting simultaneously agree who is going on which side.
      b. If going to right side, the right hand is placed on gunwale so thumb is pointing towards you and is on <u>outside</u> of gunwale.
      c. Standing slightly stooped, with both hands on gunwales, push off with feet and swing legs clear of canoe behind you.
      d. At same time push off with left hand, which swings clear.
      e. HOLD ON with right hand so contact is not lost with canoe.

C. During entire canoe rescue work do not lose contact with canoe. This is a safety precaution so all can be accounted for at all times.

D. Entering canoe from water:
   1. Parties station themselves on opposite sides of canoe at mid-canoe.
   2. Entering one at a time:
      a. one person counterbalances
      b. person entering reaches across to opposite gunwale and pulls body into canoe. As soon as possible he rolls and drops butt into bottom of canoe.
   3. Entering simultaneously is possible as long as timing is coordinated so they counterbalance each other.

E. Swamping canoe (safely):
   1. Take a position, balancing, with hands on one gunwale and feet on the other.
   2. Let weight roll canoe by falling backwards.
   3. Feet will leave their position on gunwale.
   4. Maintain contact by holding on with both hands. This is important because it keeps party from being knocked unconscious by rolling canoe.

F. Single canoe rescue: (possible, but difficult and slow). This should rarely be necessary as it is usually easier to work the swamped canoe to shore and empty it there.
   1. All parties station themselves under inverted, swamped canoe.
   2. Get as much air under canoe as possible.
   3. Make sure one gunwale is free of water to break seal of water.
   4. Working together throw canoe rightside up.
   5. While others counterbalance one party enters and bails remaining water out with hands.

G. Two canoe rescue:
   1. Swamped canoe (#1) is moved to a position perpendicular to upright canoe (#2).
   2. #2 stows all gear and paddles below level of gunwales as soon as it is in position.
   3. Two people in #2 take up positions facing each other in mid-canoe.
   4. One person from #1 goes to side of #2 opposite from #1 to counter-balance. This person does not go to mid-canoe because he'd be in the way of next step.

5. Canoe #1 is rolled to an inverted position and lifted by the two people in #2 to a position across the gunwales of #2.
6. Canoe #1 is moved onto gunwales of #2 until it is balanced, empty and still inverted, across #2. While moving #1 care must be taken not to damage the carry yokes.
7. When balanced #1 is rolled to an upright position, still on the gunwales of #2, (still being careful of the carry yokes).
8. Canoe #1 is then launched from #2 back in the same direction from which it was picked up.
9. After being launched #1 can be positioned alongside #2 and persons in #2 can counterbalance while persons from #1 re-enter.

DROWNPROOFING, MILE SWIM

by Henry Merrill & Phil Shore

I. Drownproofing:
   1. A method of survival swimming based on minimal expenditure of energy by:
      a. keeping body relaxed while maintaining a slow rhythm of breathing.
      b. utilizing natural bouyancy of body with inflated lungs in water.
   2. In deep water take a breath to inflate lungs, then completely relax body.
      a. body will sink to an almost perpendicular position.
      b. top of head should be at or just below surface.
   3. To take another breath cross arms at shoulder level (with fingers extended and together), then push down and away from body with arms (can be done with or without a slight scissors kick).
   4. Exhale breath as propelling head to surface. Head need not come out of water farther than to replenish air in lungs.
   5. As soon as lungs replenished, body is relaxed and allowed to sink.
   6. Top of head will sink farther below surface as body is relaxed but natural bouyancy will bring it back up so head is again close to surface.

II. Reasons for Mile Swim

The mile swim is designed to achieve various purposes. On the most elementary level, and perhaps least important, it is a demonstration of ability to swim sufficiently well so that thereafter the wearing of a life jacket is not necessary except in extreme weather or water conditions.

More importantly, this is one of the situations of real physical stress for most of the students. It is a chance for them to do more than they may feel able to. It can be used to nourish self confidence.

The stresses felt make this a good opportunity to point out our interdependence on each other and how we must help and encourage each other for the good of the whole group. Explaining the dangers of hypothermia is a good way to give some preliminary lessons in nutrition and the importance of physical well being.

These purposes are best achieved by an approach which is not tense (students are likely to be tense enough already) but serious. Do not present it as an obstacle to be overcome, but as an opportunity.

III. Procedures for Mile Swim:

A. Lifesaving instructions (for all situations):
   1. Students should be told to reach, throw, or row to a drowning person but NOT to go, unless they have a current Water Safety Instructor rating from the Red Cross.
   2. Even if they hold a WSI, they should go only as a last resort.
   3. All students should be instructed in mouth-to-mouth artificial respiration techniques.

B. Each swimmer is accompanied by a canoe with two persons in it. One of these persons would usually be an instructor.

C. There should be an extra paddle and life jacket in the canoe for use in reaching or throwing to a swimmer should he show signs of being in difficulty.

D. Mile swim consists of:
   1. First quarter (1/4) mile wearing shirt, long pants, and sneakers.
   2. Student disrobes in water without touching bottom or canoe, hands clothing to accompanying canoe via an outstretched paddle.
   3. Remaining three-quarters (3/4) of a mile covered at student's own pace and choice of strokes.

E. The course:
   1. First quarter mile should be along shore if possible.
      a. This is psychologically very reassuring when in the stress situation of having clothes on.
      b. Also safer should the person get in some difficulty.
   2. Remaining three-quarters mile should be in three legs if possible. This is better because it provides the student a different goal to reach rather than just lapping back and forth between two points.

F. Conditions:
   1. If possible, schedule a layover for mile swim.
   2. A sunny, mild day is most desirable.
   3. Start in the morning; the swim will take 4-5 hours for 10-12 students.
   4. Best not to have a high wind, especially if accompanied by cloudy weather or cold water.
   5. If conditions are too unfavorable, but the schedule doesn't allow any other time, the course can be shortened to 3/4 of a mile. The conditions will still make it a fair test of students' abilities and be a good challenge. Continued bad weather may cause cancellation of this altogether.

b. Keep a fire going, heating water, no matter how nice a day it is.

G. Dangers of Mile Swim:
1. Drowning: prior to swim must cover precautions in I, A, 1-3).
2. Hypothermia: body not able to generate its own heat.
a. Symptoms:
1) Uncontrollable shivering and chattering of teeth.
2) Blue lips, goose pimples, cold extremities (to touch).
b. People of slight build seem to be more susceptible.
c. First Aid:
1) Get person to drink warm, sweet liquids.
2) Get person into sleeping bag liner and bag.
3) Never put person in just bag because he can't generate the heat to warm up the nylon. Nylon will drain the heat from him and could cause shock or kill him if prolonged.
4) If person still can't generate heat in a few minutes some people must get in sleeping bag with him to provide heat until his body can generate its own heat.

H. The Rest of the Day:
1. Provide some light activity so students don't just sit around and get stiff. Perhaps a field walk with natural history keys, fishing, introduction to map and compass work over land, canoe rescue techniques.

EQUIPPING AN EXPEDITION

by Douglas Steeples

The Wilderness Program, because it was conceived as an educational program with many different educational objectives, found it necessary to consider a wide variety of types of equipment. There is not time here to detail all of the discussion and considerations that went into selection of equipment. We do need to emphasize certain things to our students, however. Among these are, first, that the initial consideration for any expedition is the acquisition of equipment of good enough quality to ensure safety in the field. We did not select the most expensive equipment available, but we did balance the anticipated demands of our expeditions against what we knew of different types of equipment. The result was a series of compromises through which we secured very good equipment, but equipment that is undergoing constant evaluation, and which will be changed from time to time.

It may be a good idea for instructors to offer a class on the problem of equipment. Students will have received information on boot selection and clothing (especially wool clothing and the importance of having enough of it). There is material in the manual on cooking equipment. These three types of equipment are designed to meet some of the expedition requirements. Our fishing equipment was selected with the similar intent in mind. We sought flexibility, economy, and enough quality to withstand hard use. The rods are among the

best available in the medium price range, and they carry an unconditional guarantee. They are useful for both spin and fly fishing. We have also provided spinning reels, and fly reels, about which instructors normally have an opportunity to talk during fishing instruction.

Our major equipment including canoes, paddles, life jackets, sleeping bags, tarps, ground cloths, ponchos, and climbing gear, were also selected to provide a reasonable balance between economy, strength and durability, and quality. Our canoes are aluminum, which is able to withstand hard use better than canoes made of other materials. We equip all canoers with life jackets. The design is simple and basic, rather than fancy. The jackets cost only $5 apiece, and yet they are of sufficient quality to do the job. For our shelter we use polyurethane-coated nylon tarps. These are open at both ends and at the sides, and they do not have a floor. They do perform the function for which a tent is designed, and that is to keep the occupant dry. By varying the way in which the tarp is pitched, it is possible to adapt to rain, snow, sun, or wind. Its ends may be closed by tying ponchos over them, to make it reasonably weather tight. Similarly, if properly ditched as well as closed at the ends, the tarp is strong enough and resistant enough to moisture to provide adequate shelter in a very severe storm. We have provided inexpensive plastic ground cloths, which protect both the sleeping bags and the ensolite pads, while helping to keep campers dry. The function of the ground cloths is to keep moisture away from the sleeping bag. If the ground cloth is laid out so that it extends beyond the walls of the tarp, the rain water may flow in and render the ground cloth useless. The ground cloth is inexpensive and light weight, which meets the needs of backpackers.

The water program uses dacron insulated sleeping bags, both because the summer climate in our canoe country is relatively mild, and because dacron retains its insulating powers and properties even when wet. It will also dry quickly, if the sleeping bags are wrung out after they have become wet. For the mountain expedition we selected goosedown filled sleeping bags. These bags, as our canoe bags, are covered with ripstop nylon, an extremely tough fabric that will not rip even if torn. The down sleeping bags have the advantage of much greater compressibility than any other type, as well as a remarkable insulating capacity. At the same time, they are useless if they become wet. For this reason we are shifting over the next few years to mountaineering sleeping bags insulated with Fiberfill II, a material that has nearly the same insulating properties as down, and the advantages of dacron when it becomes wet. We look as far as possible for mummy bags, recalling that sleeping bags are not really beds, but a form of clothing, and that they should fit closely but comfortably if they are to do their job. We seek bags with zippers made of nylon, which do not foul up as readily as zippers made of metal. We also seek bags which have insulating strips that extend beneath the zipper, so as to prevent the body of the occupant from coming into contact with the zipper, and bags that provide ample foot room.

Our pack frames are not the best available, but they are, as is our other equipment, a satisfactory compromise. They take advantage of space age technology, using aluminum or magnesium for the structural pack frame. On the frame is hung a packbag of water repellent rip-stop nylon. The pack frames themselves are contoured to fit the body. They are suspended by shoulder harnesses and a waist belt, which keep the bag vertical and concentrate its weight on the hips of the person wearing it. It would be possible to spend considerably more money on more elaborate or tougher pack frames, for example the Kelty, which is widely believed to be the toughest expedition pack frame available, and which comes with several pack bag options. Nevertheless, our pack frames and bags are strong enough and tough enough to stand up under very hard expedition use by persons who are inexperienced in the wild.

The preceding remarks are, of course, only an introduction. Students may want to add to this introduction their own knowledge and wisdom about equipment.

EQUIPMENT CARE

By Alan Kesselheim

In the wilderness, you depend on your equipment to a much greater extent than in civilized settings where there is always a nearby repair shop. Just as you do not take your physical condition lightly, you can't afford to misuse your equipment in the wilderness. Students should be shown the proper use of equipment and be told to check equipment frequently for possible problems. Often a preventive measure can be taken to put off an equipment crisis. The important thing to impress upon students is that if equipment is broken it is not possible to fix it during the program. In addition, the equipment costs a good deal of money and students will be asked to pay for items damaged unnecessarily.

1) Packs: Packs should be checked frequently for fraying straps, loose clevis pins, small rips, and the like. It should also be made clear that packs are not to be lifted by a single strap. They should be lifted by the frame, both straps together and rested on the knee, or by the strap on the frame provided for lifting. Some permissible ways of putting on a pack should be demonstrated for students. In day to day situations packs are subjected to a fair amount of wear and tear. Care needs to be exercised to keep that wear to a minimum. Packs shouldn't be thrown down, placed against sharp objects, etc. if at all possible.

2) Boots: Boots must be properly waterproofed and broken in to begin with. Unfortunately there is always one person who has neglected to do so. On the drive out Sno-seal can be made available to put some extra coats of water-proofing on boots. During the course common sense is the best guide in terms of taking safety precautions with boots. They will last longer if kept as dry as possible. Drying boots by a fire is not very safe. The chance of burning them is not worth taking and the adhesive holding the sole of the boot on can be weakened by excessive heat.

3) Sleeping bags: At all times students need to be aware of the danger of puncturing or burning bags. Groundcloths are always to be used to decrease the possibility of puncturing bags. They are to be stuffed carefully every day, not dragged around loose. If cared for properly, bags should never get wet. If they do, hope for a clear day or two as that is probably the length of time it will take to dry them. Never dry bags next to a fire.

4) Maps: Maps are another item expected to get a good deal of use. We expect them to show signs of this use, but like all other equipment, they should be taken care of. Keep them away from fire and water and fold them properly. If using map cases be careful when inserting or extracting the maps.

5) Clothing: People can't take their clothes for granted in the wilderness. If they get wet or burned, it could become a matter of life and death, not simply an inconvenience. Protect your clothing and it will better protect you.

6) Fishing kits: There are many items in the fishing kits that are easily lost. Keep track of them and remember where you put things. Also, keep the reel and rod free from moisture to prevent rusting and mildew.

7) Climbing gear: Your life depends on this equipment. Don't step on, sit on, or otherwise misuse your rope. Keep carabiners dry. Keep track of the gear and use it for what it is meant for. Be careful!

8) Tarps: If the tarps are too near fires, sparks may land on the material and burn holes in it. Also, they are prone to punctures from twigs and rocks.

9) Paddles: Again, common sense is the best rule to follow. Paddles are not crowbars. Use them properly. As a general rule do not lay paddles on the ground, but lean them against a bush or tree so they can't be stepped on. A good practice at night is to store them under an overturned canoe.

TRIP AND EXPEDITION PLANNING

by Douglas Steeples

Instructors should acquaint students with the nature of the tasks of planning trips and expeditions, so they will be able to plan their own treks. The following brief guide should be offered as a sample method of procedure.

The first task is to know who the participants are, and what their expectations are.

The next task is to balance the desires of the participants against what is known to be safe. In striking such a balance, leaders should

take special pains to assure that participants learn at what point their desires raise dangers, and how safety must shape and affect the plan of any expedition.

Persons planning expeditions need next to familiarize themselves with the terrain through maps, with or without an on-site inspection. United State Forest Service maps, which are available in various scales, offer a rough and ready guide to many field sites. So do National Park Service maps. Such maps, however, are defective in many respects. Most importantly, these maps ordinarily do not show land forms, although they do in a rough sort of way indicate the location of trails, improved campsites (if any), and water courses. Forest Service maps Class C depict various national forest sites in a much larger scale than the Class E or F maps normally obtainable at ranger stations. The Class C maps are drawn to a scale of 1/2 inch to the mile, and they show in considerable detail water courses and drainages, as well as trail locations. They offer perhaps the best large-scale maps of many wilderness areas. Forest Service maps are usually obtainable, by name and with the class of map designated in the request, from the Office of the District Forester or the Regional Forester. Information concerning the addresses of these officials may be obtained in the reference department of many of the larger public libraries of the country. Such maps may also be ordered from the United States Map Center in Washington, D.C. or Denver, Colorado. The Class C maps are available upon payment of a charge which may be as much as $5 or more per map. The smaller maps are passed out free of charge to visitors and users of national forest sites, and may be obtained in quantity by mail. The Bureau of Land Management has also begun a comprehensive mapping program on the public lands under its administration. This program is not yet very well advanced in many of the states, although it has made considerable progress in some western states.

The most useful maps are United States Geological Survey Topographic Quadrangles. These are available in various scales. Much of the country is currently being remapped on a 7 1/2 minute scale, which offers in many cases more detail than is required. These maps depict different elevations by means of contour lines, vegetal cover, buildings, and most other features of the landscape with remarkable precision. An index map is available for each state, and it may be obtained either from the United State Map office at Denver, Colorado or at Washington, D.C. Each index map identifies by name all of the quadrangles that have been mapped within a given state, indicating the date of mapping as well. Order sheets are usually enclosed with the index maps, and these may be completed and sent to the appropriate map office by persons wishing maps. Topographical maps usually sell for $ .75 each, with discounts for quantity orders.

After the maps have been studied and expedition members become familiar with the proposed expedition site, the next step is to draw on the appropriate maps the expedition route, identifying overnight stop points, and indicating the dates of each stop on the map.

As the itinerary takes shape, it should be copied in duplicate, and one copy should be left with a responsible person as the expedition sets out. Quite often it is a good idea to leave a copy with the District Ranger closest to the expedition's actual fieldsite. In event of emergency, the ranger may conveniently contact the expedition, knowing where it will be at a given point in time.

In addition each member of the expedition group, if possible, should be given topographic maps to use himself, and to mark from day to day, so that he may become thoroughly familiar with map orientation and map reading.

After all of the site planning, map orientation, and itinerary design have been completed, those responsible for the expedition must next collect and check the equipment to be used. If individuals are to provide their own equipment, it is still a good idea to check it for suitability. It is also important for one responsible person to ensure that people do not take too much equipment (always a temptation) in the field with them, and that what they have is the right kind of equipment. If responsibility for doing this is delegated, it is easier to avoid arguments.

Those who plan an expedition must also plan its food, and the means of repacking or bagging it for efficient handling in the wild. The class that we give on food and nutrition illustrates one way of dealing with this problem.

An important additional planning measure is to contact the United States Weather Service before departing, to secure a five-day forecast. The Weather Service has published information concerning extremes of temperature and climatic norms for various parts of the United States. These are often available at large public, college and university libraries. They contain a fund of information that is most helpful when one is attempting to determine what clothes should be taken, what sort of equipment, and so on.

Finally, consider what first aid equipment is to be taken, what pain killers are to be made available, and how extensive the first aid training of the leaders of the expedition needs to be. The importance of providing adequate medication and adequate training for possible emergencies cannot be overstated, for in the wilderness the stakes are very high and they extend to life itself.

A useful sort of exercise for participants on expeditions is a written quiz, in which they are invited to plan a one or two week expedition for six persons, and to file a written plan for the whole expedition indicating exactly how they would proceed in planning, and what they would plan both to do and to provide by way of food and equipment. Such a written quiz would oblige students to draw together all of their knowledge about outdoor skills and planning, and enable them to test themselves as expedition planners, at least on paper.

CAMPSITE LOCATION

by Alan Kesselheim

The uppermost consideration in choosing and caring for a campsite is the environmental impact your presence will have. There are no hard and fast rules to follow that will apply to every situation. Good judgment is the crucial thing in selecting sites. Such things as wood supply and proximity to water need to be taken into account as well as human factors like fatigue and group morale. Only a consideration of all the factors involved can result in the proper decision for a given situation.

It the group comes to a day's destination only to find an already established campsite and fireplace, it doesn't make any sense to ignore it and establish your own firepit, thus leaving two scars. Use the established site and clean it up as best as possible when through.

In campsite selection you should always consider your position in relation to water and the trail. Do not be so close to water that there is danger of contamination. Try to stay away from the trail in order to enhance privacy and minimize use of the area next to a trail which is probably used too much as it is.

As a matter of ordinary practice we expect that when a campsite is evacuated, the area should look as if it had not been used at all.

TENTING

by Douglas Steeples

On the first night of the trip to the field students will sleep under their tarps. It will be necessary for them to learn different ways of pitching tarps, and how to knot the guylines into the gromments. Guylines, which are made of nylon parachute cord, should be attached to the gromments by means of the double bowline knot and to anchors by the improved taut line hitch, neither of which will slip. While traveling, the tarps might be attached to the sides of the vehicles and extended from sides of vehicles out, probably to be attached to uprights made available for use for tenting purposes if there are no natural tent sites.

In the field students will learn to become more versatile in the pitching of their tarps. They should be acquainted with the proper siting of tarps, relative to angle of slope, location of vegetation, and stream flow and availability of water. They should be made aware of the risk of puncturing the tarp if it is pitched so that it is in contact with branches or other sharp objects.

They should learn that the ridge of the tarp should always be pitched tight. When rain is expected the tarp should be pitched low and wide, and it may be ditched so as to lead the water that runs off of it away

from the tarp, rather than into it. Anchors to which guylines are attached should NOT be in contact with the tarp itself. Students should also learn that where snow is expected the tarp should be pitched high and narrow, and that ponchos can be tied over its ends so as to render it snow tight. It may also be pitched high and wide as a sun shade when parties are not moving about and the weather is favorable.

Under no circumstances should students walk on the tarp while it is on the ground. In the event tarps leak they may be repaired with adhesive tape or mending tape, and if the leaks are small it is often effective to rub margarine or Sno-seal on them.

After initial instruction, the best way for students to learn the ins and outs of tarp pitching will be through their own mistakes. This could also provide situations conducive to discussion on the topic of students teaching themselves.

CAMPSITE SANITATION, LATRINE CONSTRUCTION, AND WATER QUALITY

by Douglas Steeples

Every patrol should construct a latrine at its campsite each night. Latrines should be dug on well drained sites, at least two hundred feet from the nearest body of water, and if possible in a place that commands a pleasant view while sheltered from the view of campers in the adjacent campsite. Students should be taught that there are several varieties of latrines. In general, for a one night stop, a patrol of six to ten persons will want a latrine that is eighteen inches or so deep, about eight to twelve inches wide, and up to eighteen to twenty-for inches in length. This ideal size is rarely possible in Ontario due to bed rock, which is usually found about 8-12" below the surface. Nevertheless the principle remains the same.

The earth removed from the pit should be placed beside the pit, and students taught after each use of the latrine to deposit some fresh earth in the latrine to cover the contents, and to burn toilet paper. Students may be taught to squat over the latrine or straddle it, or that latrines may be sited so that people may sit on logs next to the latrine, lean against logs next to the latrine, or if there happen to be down logs or conveniently located branches, these may be placed parallel over the latrine to provide a seat for the users.

The path or route from the campsite to the latrine should be marked by placing small coins or bandanas along the way. Students should be advised that when approaching the latrine they might make some commotion, so that if the latrine is occupied, the occupant will have time to warn them away without a violation of privacy.

When it is time for the patrols to move, one person should be designated to close the latrine, after first ensuring that all persons who need to use it have done so, and that all of the markers of the way to the latrine have been removed. The latrine should then be carefully filled with earth, so that none of its contents are exposed.

Forest litter and other materials should then be scattered over the latrine site, so that no trace of it remains.

Instructors will probably want to offer a class in latrine construction at the end of the first day out. They will also want to be certain that each member of each patrol is responsible for digging and closing at least one latrine. As with campsites and fireplaces, the patrol should not move until the leader designated for the day has had time to inspect the latrine to ensure that it has been properly restored to natural conditions. In order to add at least one appealing element to a task that may otherwise be unappealing, instructors may wish to initiate informal contests in latrine building, promising some form of recognition--whether it be a mere compliment or something else--to the student who constructs the best, most beautiful, or appealing latrine.

Just as a proper latrine is essential to a hygienic campsite, so is it important to remind the students of the importance of treating their water supply with respect. Under no circumstances should students ever place bars of soap in bodies of water, nor should they ever wash themselves or their clothing with soap in streams or lakes. Instead, the water to be used for washing should be taken in billy cans to a site from which the soap laden waste water is not likely to percolate back into the stream or lake except through the soil. One to two hundred feet from the water source is recommended. There, washing and rinsing may safely be accomplished.

In order to reinforce the importance of keeping soap away from streams, instructors should remind students of the fragility of stream and lake life communities. Water ecological communities supporting trout populations are especially vulnerable to pollution and even a very minute amount of soap in such bodies of water is sufficient to disrupt the life system. It should also be pointed out that soap is the best laxative known and the lakes and streams are the source of drinking water for the group.

Finally, there remain personal hygiene and care of cooking utensils. Students must learn to keep themselves clean--and instructors may have to be ingenious to make this point, resorting to "morning dips" or setting examples while encouraging initiative. Cleanliness is conducive to healthiness, as well as a more pleasant group. Cooking utensils, pots, etc., are to be <u>boiled</u> briskly after a through scrubbing with sand and water, or "mountain brillo" (pine twigs) and water. <u>No soap</u> should be used as even a tiny reminder of soap can cause diarrhea, as can an accumulation of food or fat wastes in poorly cleaned cooking and eating ware. Students must also learn to dig and use a slop pit or grease pit near their fireplaces (rather than carelessly throwing out slop). They must cover each deposit of waste with a bit of dirt, and fill and camouflage the pit when camp is broken. Garbage should be burned thoroughly, only liquid slops going into the pits. Food supplies are to be kept sealed when not in use, packs closed--and if there is danger of "varmits" getting into stored food it should be suspended from a tree by a rope some eight to nine feet from the ground.

FIRES, FIRE BUILDING, AND FIREPLACES

by Douglas Steeples

The Wilderness Program emphasizes the importance of being able to build a fire in the wilderness under adverse conditions. Instructors should each teach at least one class in fire building. This class should include such things as the construction of fireplaces, selection of suitable tinder and firewood, the appropriate size of the fire, the technique for dousing the fire, and for destroying all signs of a fireplace.

The first task is to instruct students in the proper construction of firepits. The students should be shown how to remove the duff cover from the ground at the site of the firepit, and how to place rows of rocks along its sides and front to keep the fire from spreading into the surrounding duff. They should learn to locate the firepit at least ten or fifteen feet from the closest inflammable plant life. After the firepit has been built instructors should demonstrate two or three techniques of fire building. These would include the use of very small twigs stacked as in a teepee, the use of a small pile of twigs and litter into which a finger has been inserted to make a hole for the match, and the carving and use of the feather stick as an emergency device in wet weather. Students should master these three techniques of fire building, so that they can safely and successfully light and support fires even in pouring rain.

Instructors, while teaching techniques of fire building, should explain to students the importance of collecting a small supply of tiny twigs--smaller in diameter than wooden matches and preferably without bark, - and saving these small twigs, together with a few larger ones, and perhaps whittled dry wood shavings, in plastic bags in their packs so that dry tinder will always be available.

Students should also learn that even in a drenching storm there are usually small dry twigs beneath the boughs of evergreens, close to the trunk. In addition students should learn that the under or insides of down logs that are rotting normally contain dry and inflammable wood, and that even in a pouring rain once a fire has been lit it is possible to protect it and keep it going by covering it with a stump, which as it dries becomes fuel.

Students should learn that under no circumstances should they remove branches from standing trees. Only in event of a downpour when no dry twigs are available elsewhere are standing trees to be regarded as sources of tinder or firewood. Reliance will be on down wood everywhere. This expectation is consistent with our emphasis on conservation. There are few more unsightly views than that of a campsite surrounded by standing dead trees all of whose lower branches have been removed, unless it be a campsite around which the lower branches have been removed from living trees.

After the campsite has been used and it is time to move on, students will be expected to douse their camp fires thoroughly with water. After the fires are out the ashes and coals should be picked up with their bare hands and scattered in all directions. This will spread and make less visible the signs of fire. If the coals are too hot to handle, the fires are not out, and this technique provides an additional bit of insurance that the fires will be put out. After the ashes and coals have been scattered, the fireplaces themselves should be dismantled. Rocks should be replaced in the earth with the sooty side down, dirt spread over the fire site and a bit of forest litter scattered so that no trace of the fireplace remains.

Upon leaving, students should make certain that they have supplies of twigs and matches safely packed in plastic bags so as to protect their dryness. They should, of course, have long since learned that while using fireplaces they should not place their plastic bags of food close to the fires, nor should they pour from them directly into cooking pans, because the risk of damaging the food bags is too great. Paul Petzoldt of the National Outdoor Leadership School demonstrates this point very dramatically by kicking into a fire any food bags which he finds lying next to it. As a matter of habit we hope that our students will keep their food bags at least three feet away from their fireplaces.

FOOD AND NUTRITION

by Douglas Steeples and Phil Shore

The idea of living off the land sounds great - no heavy food to carry, fresh flavorful products, variety, you name your dream. But forget it. It just doesn't work, unless you plan to do almost nothing else but gather your food from morning till night, and even then forget the variety. Leave this dream to those who haven't tried it or perhaps live on a south sea island.

We eat primarily to fuel our bodies. This is by far the most important function of our food. If this were the only function, we could probably devise some homogenized bar which contained all the necessary daily requirements of calories, fats, proteins, carbohydrates, vitamins, minerals, amino acids, etc. and give each person a supply. However, the wilderness experience is more complex than that. Small joys like a hot cup of cocoa can be as important as getting to the top of a mountain in the overall wilderness experience. Good food keeps our spirits up during rainy, foggy days, improves the scenery, and the company. Conversely, bad food makes the rain colder, the lakes longer, the trail steeper and the other people on the trip next to impossible to get along with.

Our food program is designed to fulfill nutritional demands, provide pleasure in eating and sharing food with friends, and to provide a suitable basis for education in nutrition and cooking.

First, the rations used should be inexpensive. We hope through the use of inexpensive rations to teach students that wilderness activity is not the province of the rich, but a form of leisure activity in which persons from all walks of life may engage.

Second, we rely on rations that are widely and readily available. We wish to avoid specialized, pre-packaged expedition foods.

Third, we have selected foods that are nutritious.

Fourth, we have attempted to devise a rations list that is varied, that invites experimentation with many types of food dishes.

Fifth, our rations list depends primarily on versatile raw ingredients, to oblige students to be creative in their camp cookery. We assume that the development of skills in cooking will afford students a significant asset both in and out of the wilderness. At the same time the encouragement of cooking will provide a recreational outlet and a creative activity for students while they are on expedition.

Among the other principles that shape our food philosophy is the recognition of special metabolic needs in the wilderness. These needs may be analyzed in terms of the energy demands placed on expedition members, the varying energy yields of different food groups, and the different rates of metabolization.

Of the three food groups carbohydrates metabolize (that is are completely digested and absorbed into the body for its use) quickest, in one to two hours. The energy yield of carbohydrates is 4.2 calories per gram, or 1800 calories per pound. This energy yield, together with the rapidity with which carbohydrates are metabolized, means that the consumption of carbohydrates will support quick energy demands. Because of the extraordinary energy demands placed on expedition members, the rate at which carbohydrates metabolize, and their caloric yield, we have determined that they should comprise a major share of the diet.

Proteins offer a caloric yield nearly as high as that of carbohydrates, at 4.0 calories per gram, or about 1800 calories per pound. However, proteins metabolize more slowly than carbohydrates, requiring 3-4 hours or more to metabolize completely. Thus, while their energy yield is approximately the same as that of carbohydrates, it becomes available much less rapidly. Proteins are essential in the long run for the building of muscles and maintainence of tissues and other bodily material, and the need of the body for protein is continuous. The normal bodily requirement per person per day for proteins is 70 grams. Under expedition conditions it follows that protein requirements should comprise around 20-25% of the diet.

Fats, the third food group, offer the highest energy yield, at 9.0 calories per gram or 4200 calories per pound. Fats are a primary source of energy, and of fat saturable vitamins as well. Fats metabolize in 3-4 hours or more. Used to excess, fats tend to become unpalatable, and hence it is important to control their relative portion in a diet.

The relative proportion assigned to foods from each of the three groups in our rations program also takes into account the results of some studies of the effects of specialized diets. In these studies, one of the most notable of which was conducted by the French military forces, it was discovered that subjects who lived on exclusively fat diets experienced a rapid deterioration of mental and physical efficiency under extreme conditions. Subjects on exclusively protein diets deteriorated more slowly, but suffered notable energy losses over time as well as deterioration. Subjects on exclusively carbohydrate diets maintained maximum physical and mental efficiency for the longest periods of time. The conclusion of these studies was that the quicker availability of energy from carbohydrates was the important variable.

Persons with adequate energy intakes can maintain efficiency under extreme conditions for periods of several weeks, although it is clearly shown that a long term protein deficiency will result in a gradual deterioration of body tissue. These studies suggest that our diet should include about 25% each of fats and proteins and approximately 50% carbohydrates.

Energy requirements for expedition life set approximate limits for gross food intake per person per day. A normal American adult uses about 1700-2000 calories per day for basal metabolism - that is, simply to stay alive. Energy expended in activities, then, requires caloric intake beyond basal metabolic requirements. A normal adult may use 1300-1800 calories per day in activities in addition to the 1700-2000 required to sustain life. For example, to walk on the level at two miles per hour, an average pace for a casual walk, requires 45 calories per hour for each 100 pounds of body weight. To do so at three miles per hour doubles the caloric requirement to 90, while to do so at four miles per hour increases the requirement to 160 calories per hour per one hundred pounds of body weight. To run increases consumption to 320 calories per hundred pounds of body weight per hour. Rowing is even more strenuous, using up to 730 calories per hundred pounds of body weight per hour.

Other activities that provide us with bench mark measures of caloric requirements include shivering, muscle spasms designed to warm a cool body, which requires 220 calories per hundred pounds of body weight per hour. This relatively high rate of consumption reflects both the intensity of shivering as an activity, and the purpose of shivering, which is to generate heat, by using the energy supply available in the body and converting it to heat. Perhaps more to the point for our purposes, climbing 1000 feet requires in addition to the requirement for walking at whatever speed 110 calories per hour per hundred pounds of body weight. Note that a pack has the effect of increasing body weight.

What this amounts to is that normal daily demands in the wilderness can reach four or five thousand calories per person per day in moderate weather. If the weather should become extreme--windy, wet, and cold, the caloric requirement will rise even higher, perhaps even to six thousand per day. In order to meet these requirements, which are about three times those of sedentary Americans engaging in normal life pursuits, we anticipate that students will use about

two pounds each per day of the raw food ingredients provided in their rations. These two pounds consist of the foods before water or other liquids have been added.

In addition to calories, the body requires various vitamins, minerals and amino acids. The body cannot make these so they must be provided in the daily food. Vitamin A is normally supplied by fresh vegetables, but our sources are milk and margarine, as dehydration destroys the vitamin. It is used to keep the skin healthy and for vision. Thiamine and riboflavin are in the flour, brown sugar and molasses. Niacin is contained in beans and fish (if you can catch some). These three are used in food breakdown and energy transfer within the body. Milk is our source for vitamin D which is needed for calcium metabolism. Vitamin C is in our fruit drink and in fresh (uncooked) greens.

Since certain amino acids are needed to metabolize others, a balanced intake (from proteins) is needed to utilize all of them fully. Cereals are low in leucine but high in the 21 other amino acids, while legumes and dairy products are high in all. Meat is also high in leucine. So, since our food has very little or no meat, cereals plus either dairy products or legumes are needed with each meal. For example, a dinner might have a cereal (noodles, rice) plus legume (TVP chicken bits, split peas), and a dairy product (milk, cocoa). Lunch might include a cereal (corn, wheat or oat bread) plus legume (peanuts) and dairy product (cheese).

The list of food ingredients per person per week issued to students is based on the preceding information. This list, for purposes of convenience, may be broken down into the following categories.

A. Dairy and legumes (important protein sources, also fats)
   1. margarine - .75 lbs.
   2. cheese - 1 - 1.5
   3. milk powder - .4
   4. chicken bits - .12
   5. ham or bacon bits .2
   6. chicken base - .1
   7. meat base - .1
   8. split peas - .25

B. Seasoning--seasonings have no nutritional value, but are important to add flavor, color, and texture to the menu.
   1. plastic bottles each of salt, pepper, yeast, chili powder, curry powder, cinnamon, garlic, nutmeg, oregano, sage.
   2. rock salt - (mountain program only) .15-.25
   3. tea bags and freeze dried coffee as desired
   4. carrots - .12
   5. peas - .12
   6. green peppers - .05
   7. tomato flakes - .15
   8. onion flakes - .12

C. Fruits and nuts--which contain food values from all three of the food groups.

1. peanuts - 1-1.5 pound (Peanuts have been described as a complete food, as are many nuts, in that they offer ideal ratios of nutrients from all three food groups. It would be possible to survive healthily on an exclusively peanut diet, if a person could stand it.)
2. dried apple slices - .5 pound
3. dried peaches, pears or apricots - .5 pound
4. raisins - .75 pound

D. Carbohydrates--first food items that are primarily sugars.
1. sugar--1 pound
2. fruit crystals - .75 pound
3. jello - .25 pound
4. pudding - .25-.5 pound
5. cocoa - 1-1.25 pounds
6. molasses - .12 (also a spice and major source for minerals)

E. Carbohydrates--the staple food list, with which most of the cooking is done.
1. rice - .75 pound
2. corn meal - .25
3. whole wheat flour- .75-1 pound
4. bisquick - .75 pound
5. macaroni - .35
6. egg noodles - .25 pound
7. gingerbread mix - .25-.5 pound
8. oatmeal and/or ralston - .75 pound
9. potato flakes - .5 pound

F. Special. Instructors may wish to carry some special food items to raise morale and provide treats. Among the suitable items are the following:
1. hard candy for instructors to share with students
2. oranges and citrus fruits for sharing, eating, and for use in cooking special breads and goodies.
3. honey, good tea and so on
4. popcorn
5. cheese cake mix
6. sour cream mix

Each cook group is equipped with sufficient cooking equipment to allow experimentation and the creation of a wide variety of dishes. Cook kits include a 1) teflon lined (easily cleanable) aluminum fry pan, with a lid, that may be fitted over the pan and heated with coals to convert the frying pan into an oven; 2) one billy can per person; 3) one Sierra cup each which serves as plate, dish, and cup. Sierra cups have been selected because they are strong, can hold a lot, and have wire handles that do not transmit the heat of the food or liquid they contain to the hand; 4) a teaspoon each for eating; and 5) one stainless steel mixing bowl. This is heavy but doesn't melt if left near the fire and it is easily cleaned and very helpful in cooking ambitious dishes; 6) one plastic spatula, for use in the teflon frying pan. Note that metal implements will scratch the teflon surface and damage it, making it difficult to clean the frying pan and eliminating all advantage in having teflon pans; 7) one wooden spoon, for mixing, and for stirring things in the frying pan; 8)

cloth bags for the frying pans, and billy cans. These bags are useful to protect the contents of packs and the insides of packs from the sooty exteriors of billy cans and frying pans. They make it unnecessary to scrub all of the smoke and soot from each cooking pan after each use.

Instructors are expected to be thoroughly acquainted with all of the above, and at some suitable point be prepared to convey it to their students in an organized class on the program's food philosophy, nutritional principles, and hopes about cooking. Instructors may also wish to point out that the importance of foods and of our nutrition and cooking program, and the amount of thought that has gone into this aspect of the Wilderness Program, serve as good illustrations of the degree to which the program has been carefully planned out. More detailed information is available in the NOLS Cookery book.

As a final note, instructors may wish to mention that our program differs from most other outdoor programs in the emphasis that it does place on food. The Outward Bound schools and programs modeled after them regard food as something to be eaten as quickly as possible and with as little thought as possible. Its place as a morale builder, a stimulus to creative activity, and an educational instrument through which students may become aware of their energy requirements and the ways in which diet and nutritional principles relate to them, are all minimized. Our food program has been adapted from that of the National Outdoor Leadership School in Lander, Wyoming, and is intended to make food a central educational feature of the program. As such our food program takes its place as one of the more important teaching dimensions of the Wilderness Program's specialized activities.

FIRST AID AND HEALTH CARE

One of the principal tasks of instructors, as they train students to become responsible and thoughtful members of an expedition who are capable of planning and executing their own expeditions, will be to provide adequate teaching in the areas of first aid and health care. The same principles that govern instructors should also govern students. Of these, the development of a proper attitude is perhaps as important as anything.

Three ideas are important here. First, prevention and preventive care are best. Second, first aid is just that, it is emergency care provided to protect and maintain life and bodily functions until second aid or competent medical care can be offered where it is needed. Third, leaders must have the ability to meet emergencies and confidence in their ability to do so.

Instructors, and students as they become conversant with the techniques and responsibilities of leadership, must be given a growing self-confidence. Among other things, this kind of self-confidence means that when emergencies develop, the leader of a group must

insure that one person takes charge, probably himself. To allow a group to make all decisions in the face of emergencies is to waste valuable time and assume unnecessary risk.

The Red Cross book, FIRST AID, will be viewed as the definitive manual for Wilderness Program staff. The comments that follow are intended as a summary of major categories of aid problems one might expect to encounter on expedition. Instructors will carry into the field Fred T. Darvill's MOUNTAINEERING MEDICINE for handy reference. It is expected that they will have committed to memory both the contents of Darvill, and of this section of the Instructor's Manual, both for purposes of preparation to meet emergencies and for teaching purposes. They will teach both Darvill and this section of the Manual while in the field. We expect them to be thoroughly familiar with dressings and splinting, about which we shall say little here.

Attitude

It is crucial that the instructor think, recall that preventive action is best, first aid is just that, and believe that he can do what is necessary. It is imperative when a health condition or emergency develops to:

Lead by assuming responsibility for meeting the problem, and ensuring that the best-trained person takes the key aid role.

Organize the group for most efficient action. This may entail assigning a large number of tasks and responsibilities to different individuals -- preparing dressings, gathering wood and making a fire, constructing a litter, setting up a bivouac, getting messages out (always in writing, always with an appropriate-sized party, always with an exact duplicate copy remaining with the instructor, always with a marked map), or in case of severely traumatic events finding busy work for students whose presence could disrupt the task of caring for the injured. What to do to preserve student morale in such instances will be treated orally in training sessions.

Record the exact timing and sequence of events associated with an injury or illness, and the administration of aid, in writing, and in duplicate. This task will require the attention of an individual who will do nothing else. This information is essential for subsequent program report.

Recall that certain aid tasks are "time element" tasks, noted below. After they have been completed, there is usually time for reflection and deliberate action. Think.

In general, keep subject in prone position, on back, and warm. Do not move until extent of injuries is ascertained.

Life Threatening Events/Emergencies

1. Check breathing. Check breathing first upon reaching an injured person. If denied oxygen 4-6 minutes, the brain suffers irreversible damage. For DROWNING, see #9 below.

IF THE SUBJECT IS ASHEN GRAY, PUPILS EXTREMELY DILATED AND NOT RESPONSIVE WHEN YOU OPEN EYELIDS, IF 15 MINUTES HAVE PASSED SINCE A TRAUMATIC INJURY, SUBJECT IS DEAD.

If the subject is not dead, several steps must be taken promptly to assure breathing. Before administering artificial respiration, clean air/breathing passages. Otherwise artificial respiration will force junk into air passages, block them, and kill the subject. Clear the mouth and throat of food, assure that the tongue is positioned so as not to block air, remove dentures, etc. In order to clear the mouth, place one hand on top of the subject's head and tip the head back, elevating the chin. Then carefully open the mouth (you may wish to wrap the fingers with which you do this in a bandana to lessen injury if the subject bites involuntarily) with the other hand, and remove all matter that will obstruct air flow.

When administering mouth to mouth artificial respiration make sure that the subject's chest rises with each air inflow. If it does not, check the rib cage, for there may be pierced lungs. While administering respiration, continue to hold subject's head back, as when you cleared air passages, with one hand. Hold the chin so as to keep the mouth open and tongue from obstructing air passages with the other hand.

2. Next, check heart action. There is no point in checking this before breathing, as it is of no use unless the subject is breathing and taking in oxygen.

3. Then, check for bleeding. Arterial bleeding, most serious, will spurt; venous is more steady.

Bleeding rarely threatens life as severely as the absence of breathing or heart action. And in the case of bleeding, time favors the administrant of aid. A subject who is bleeding may be able, through involuntary nervous action, to contract vascular flow and survive on as little as 25% of his blood supply if kept inactive. Time also allows clotting action to occur.

There are several things to consider and check when one is examining a subject for bleeding.

No help is possible in the case of aortic bleeding.

For gross external bleeding, several remedies are possible.

The best is the application of direct pressure at the point of bleeding. Use a clean, absorbent compress. Apply tightly.

The application of pressure at the classic "pressure points" is generally less effective, as in some subjects the "points" are difficult to locate. But this technique may be employed as a supplement to direct pressure, or where direct pressure is either ineffective or impossible as a substitute.

Tourniquets are a last resort measure for bleeding in the limbs. They should be used only where the choice is between loss of the limb and loss of life. Once applied, do not loosen the tourniquet, because of the risk of spreading a gangrenous infection from the extremities beyond the tourniquet.

Hidden or internal bleeding poses a different set of problems.

Gastrointestinal bleeding will cause the abdomen to swell and become hard to the touch, feel tender to the subject. There is little that can be done in the field for such bleeding, except to prepare for evacuation if the subject can be moved, or send for outside help if he cannot.

Head bleeding is rarely a threat to life unless there has been severe trauma, skull injury, and brain damage.

HEART MASSAGE may be necessary if heart action has ceased. You will have been taught proper technique in classes before going into the field. In performing heart massage it is most important that you lean directly over the subject's chest so that you can, after crossing your hands palms down at a point about 3" up from the bottom of the subject's rib cage, keep your arms straight and apply your weight straight down. It will be important to massage at a rate of about 55-60/minute. Be sure that you have ascertained through a quick check the condition of the rib cage before beginning, and recall that sometimes a sharp blow to the massage point (administered by striking your fist hard on a hand placed flat and palm-down at the indicated point) will cause the heart to resume beating.

Resort to CARDIO-PULMONARY RESUSCITATION if both breathing and heart action have ceased. This is exhausting work if undertaken by a single person, since it will be necessary to approximate both a heart rate of 55-60/minute and a breathing rate of 15-20/minute. If only one person is available to administer this aid, the technique is to proceed by administering 15 heart massages, interrupt with 2-3 breaths, then 15 more heart massages, and so on. If this aid is successful, carotis or femoral pulse will start, color improve, and pupils contract in response to light.

Never interrupt heart massage more than five seconds once you have begun. A good massage will break some ribs. You will need a hard flat surface for successful massage. And you must know when to quit. Massage will, with respiration, keep a subject in the gray area between clinical and biological death. The former is cessation of breathing, heart, and circulation. The latter involves cell damage, which begins in 4-6 minutes after oxygen supplies cease to reach cells. If you do CPR for 15 minutes and subject's pupils remain dilated, color bad,

although shallow breathing and perhaps a faint pulse develop, subject is dead. If you work 30 minutes and had a bit of a heartbeat and breath, and temporary pupil recovery after which pupils again dilated only ceased to respond, subject was too severely injured to recover.

After breathing, heart action, and bleeding have been checked and aid administered as needed, there is time to act more deliberately. Avoid well-intentioned haste, which can be fatal. Think.

And proceed to check for other life-threatening injuries, examining and responding in this order of priority

4. Severe head injury

   Treated below with brain and spinal cord injuries

5. Severe medical poisoning

   Unlikely on expedition

6. Open chest wound

   Although not probable on expedition such a wound is serious because it destroys the vacuum which allows the lungs to work. If present, tape the wound or even plug it with clothing and then tape it closed, so that the lung on the uninjured side can take over. A wound of this type will make a gurgling sound as the subject breathes. Your effort here is to prevent air pressure from collapsing the other lung or stopping the heart.

7. Gut/abdominal wound

   If the gut is perforated and waste material enters the peritoneal cavity, there is no field remedy except immediate evacuation to allow prompt medical treatment to prevent a fatal incidence of peritonitis. Sulfa drugs and antibiotics are of limited use in the 2-4 days you have to reach medical care.

8. Injuries to the neck and spinal cord, brain

   To examine, ask the subject questions about sensation in the extremities, feelings of pain, ability to move the extremities if he is lucid. If the subject is not lucid, resort to observation. High risk in moving--be careful.

   There are a few symptoms to help identify the nature of injuries of this class. If the subject can move arms but not legs, the injury is probably below the neck in the spinal column. If the subject cannot move arms, the cord has been damaged in the neck.

To administer aid:

If there is no leg nor arm movement, splint the subject with care, to immobilize. Move with extreme care, and only if necessary. Likewise, if the subject has feeling in and can move arms, but no legs, splint and move with extreme care.

Where the subject must be moved, keep the back and shoulders straight. But DO NOT STRAIGHTEN THE SUBJECT OUT IF HE SHOWS THESE SYMPTOMS AND HAS FALLEN INTO A CONTORTED POSTURE. Make the subject rigid in the posture in which he is found. It may be necessary to construct a body splint to preserve the posture, with the head padded and tied into position, the body made rigid, and evacuation begun.

If the subject is discovered doubled up, for example in a crevice, you have a problem, and must make a decision. Try to assess him where he is, determine if possible whether he can move arms and fingers. If he can, there is probably no neck injury, but you must still get him out of the crevice and splint him up if there are injuries to the spinal column.

As a general principle, the higher the neck injury the greater the danger to breathing, heart, and so life. So try to care for a patient with a neck injury without changing his posture, splint him in the posture discovered. If the subject is "crumpled down," it is still possible to splint in posture and move with a carry through the armpits.

If the subject is unconscious, aid is difficult to determine as there will be no response to stimuli. In such cases be sure to examine pupils for dilation. If the pupils are dilated and do not respond to changes in light, this is a sign of brain death even where the subject may still exhibit slight breathing. Should the subject be comatose, the pupils dilated, the heart-rate 60-80, you will need to decide what, if anything to do -- aid could keep the vital signs active but result in returning a vegetable to society. These decisions are the most difficult of all, but they are in some instances unavoidable.

9. Drowning

Aid consists of an immediate administration of artificial respiration. Do not try to drain lungs of water before commencing as your efforts will only waste time and remove little water. The best aid for drowning is prevention in safe water practices.

Injuries that do not normally threaten life

Most of the injuries that we are likely to encounter fall into this class. Even so, they require prompt and intelligent attention. The most common are likely to be, in order of seriousness:

1. Fractures

As a general rule, splint so as to immobilize affected area in the posture found. However, if there is acute angulation -- for example of a broken limb -- apply tension and straighten before splinting. This will, with proper care, prevent greater injury. Do not straighten fractured spines, wrists, and knees. These structures are unprotected and involve nerves and arteries. Immobilize them as found. When splinting, be sure to splint above and below the joints on either side of the fracture, padding the splints.

Fractures often bleed copiously, but bleeding associated with them is rarely life threatening. Where a thigh has been fractured, though, bleeding is greatest and special care must be taken.

2. Brain and head injuries

These include the following, in order of seriousness:

Concussions (a bruise/shock to the brain)
Contusions (bruises)
Lacerations (cuts)

Symptoms for brain injuries:

Are the pupils equal? It is a good idea to run a pupil check of all students before the expedition begins, since some people have unequal pupils. Unequal pupils are a symptom of concussion, as is a headache, nausea, faintness, pale coloring, or unconsciousness or great drowsiness. Aid includes provision of warmth and rest, nutrition, observation. Where a concussion is suspected, evacuation must be considered.

Skull fracture

These may be closed/simple, or compressed.

If the skull is hugely swollen and feels mushy, you must decide whether compression involving brain damage has occurred. If the front of the brain has been damaged, the subject will act "goofy," as that section controls personality. If the subject has trouble with legs, the brain damage is at the top of the head. If there is a problem with vision, the damage is at the back of the head. IF BLOOD IS RUNNING FROM THE EARS, there may be a fracture at the base of the skull. A basular fracture MAY BE LIFE-THREATENING, as that section of the brain controls vital functions -- breathing, heart.

IN EVENT OF A BASULAR SKULL FRACTURE, SPLINT AND EVACUATE lying face down with head turned and held to the side it was facing when you found the subject. Be sure that the subject has an

air passage for breath. Where basular fractures are suspected clean the ears to determine source of blood, whether from a small ear wound or a skull injury, as an aid in diagnosis.

3. Acute abdominal wounds/injuries. These include

   Ulcer
   Appendicitis
   Puncture wounds

   Normally such conditions allow a couple of days' time, so the remedy will be evacuation. Even where the subject is unable to eat, he will be able to suck peppermints and the like, which should help maintain a degree of vitality.

4. Shock

   Shock is a profound depression of all body processes that may follow any injury, but especially major injuries. Hemorrhage, cold, pain, and rough handling are intensifying factors. When a subject is in shock, the entire circulatory system has dilated hugely, to as much as 7 times its normal capacity and far beyond the capacity of the blood supply to fill it. Symptoms include paleness, cold clammy skin, weak pulse, and rapid heartbeat. Shock can often be more serious than the injury that causes it. Treat by placing subject prone, on back, warming, elevating the feet, controlling bleeding and relieving pain, treating gently.

5. Abrasions, lacerations

   Remember chiefly to cleanse, stanch bleeding, apply clean dressings. Only one person, whose hands are clean, should touch the dressings.

6. Sprains

   Sprains are a stretching or tearing of the ligaments in the region of the joints, followed by hemorrhaging, swelling, and tenderness. Attempt to treat within 30 minutes by application of cold packs and elevation of the sprained joint, if possible. If possible tape to strengthen. Aspirin may relieve pain.

7. Strains

   Strains are ruptures in the lining covering a muscle or a tear in muscle fibers. It differs from a sprain because it occurs in a muscle belly rather than at a joint. Symptoms include pain and localized tenderness. Treat by applying cold and taping in position.

8. Burns

   Burns pose several types of hazards, including damage to the skin from heat, and the searing and shock producing effects of superheated air in the lungs and respiratory passages. There

are three types of burns -- thermal, sunburn, and chemical. Only the first two are likely to concern us. We may also classify burns by degree, although the degree may differ in different parts of the body and be difficult to determine at first. In first degree burns the skin is reddened. In second degree, blisters develop. In third degree tissues are more deeply damaged, with destruction of the underlying growth cells that form new skin, probably a charred appearance.

Prevention is again crucial. The objectives of aid are to treat for shock, relieve pain, and prevent contamination. The danger of shock is greatest when there are second and third degree burns, and shock is a major hazard causing most burn deaths within the first four days. It is likely when 10 percent or more of the body surface is burned. Any subject with serious burns should immediately be transported to a hospital.

For minor burns immediate immersion of the affected area in cold water is often helpful in relieving pain. This is risky, though, since burns are often more serious than they at first appear. The best aid is to exclude air by the application of several layers of a dry (wet sticks) sterile dressing. Do not rupture blisters, be sure your hands are sterile, and transport a seriously burned patient immediately to medical aid. Attempt to elevate severely burned extremities. To preserve body fluids administer at 15 minute intervals half glass doses of a solution made by dissolving 1/2 tsp. salt and 1/2 tsp. baking soda in 1 quart water.

Sunburn, resulting from ultraviolet rays rather than heat, but treatment is the same as for thermal burns.

Evacuations

It is ordinarily necessary to evacuate subjects if they have suffered abdominal punctures (because of danger of peritonitis), appendicitis, or life-threatening events or injuries. Evacuation may be called for where the subject suffers from such conditions as acute mountain sickness, frostbite, burns, and sprains, so severely as to create a high risk either to the subject or the completion of the expedition if he remains with it. All instructors must offer a class in litter construction and evacuation techniques.

Health Problems That May Arise

Expedition activity entails the risk that a number of health conditions and problems may arise because of exertion, stress, and the rigors of outdoor living. The list of possible conditions is nearly endless. For practical purposes, however, we shall confine our attention to only a few of the most likely.

1. Colds, Sinus Trouble

Reduced barometric pressure, variable temperatures and cooler days and nights as elevation increases, together with exertion,

can increase susceptibility to sinus drainage and trouble, colds, and the like. It is most important to assure adequate rest, warm clothing, and good diet as preventatives.

2. Dehydration

This is perhaps the most common problem for mountaineers, given water loss through heavy breathing and perspiration accompanying extreme physical exertion.

Symptoms include dizziness upon standing up and lackadaisical feeling. The condition can develop slowly. The remedy is to ingest quantities of water and take salt as recommended in expedition rations.

3. Mountain Sickness

Mountain sickness is a condition or complex of conditions that may develop at higher elevations. For most persons, it is unlikely to develop below 9,000 feet, although in some it may appear as low as 7,000 feet. It consists of anoxia -- reduced blood oxygen, hypoxia -- loss of body fluids through heavy and/or rapid breathing to regain normal oxygen levels, and hypocarbia -- a loss of CO_2 in the blood through the preceding and high activity, making the blood more alkaline than normal.

Symptoms include nausea, headache, lackadaisical feeling, shortness of breath, and may in acute cases include temporary loss of consciousness or fainting, hyperventilation, and either a very rapid heartrate or perhaps fibrillation of the heart when the subject is both very run down and frightened. In rare instances a subject may suffer temporary blindness.

The remedy is to rest, take salt, drink quantities of water, take nourishment, and keep warm. In acute cases it may be necessary to remove the subject to a lower elevation, or even to evacuate.

4. High altitude deterioration

Uncommon below about 15,000 feet, most common above 20,000 feet. Symptoms are accentuated versions of those for acute mountain sickness. Treatment must include removal to lower elevation, as this condition may involve actual brain and other cell damage because of oxygen deprivation.

5. Hypothermia (exposure)

A loss of body heat, this condition may develop so slowly as to catch the subject unawares. Symptoms include a bluish coloring, and in the first stage shivering to produce additional body heat through involuntary muscular activity. The length of the shivering phase, which may continue until the temperature of the body core is about 92 degrees, depends on available carbohydrate reserve and how exhausted the subject is. When the core temperature falls below 92 degrees, the subject can-

not produce enough body heat to recover. In this stage he has a masklike face, glassy stare, mumbling voice, and mental confusion. Blood pressure and heart rate are reduced, and a diffuse, foamy pulmonary edema may occur. Below 85 degrees core temperature the victim displays langor and loss of muscular coordination, a slow irregular heart beat, and sinks rapidly to death as the core temperature approaches 80 degrees. Treatment involves the application of external warmth through prewarmed garments, placing other persons in a sleeping bag with the victim, administering warm sugar water and the like.

It must be emphasized that hypothermia can develop anytime the air temperature is lower than body temperature, humidity is low, wind is high, and/or the subject tired. It is likely, too, upon completion of or during the "mile swim", or drownproofing, for canoers.

6. Frostbite

Frostbite is freezing of the tissues, most commonly the fingers, toes, and face. There are several degrees of severity. In the first degree, the affected part is cold, white and numb. After warming it reddens to resemble a first degree burn. In the second degree a blister forms after warming. In the third degree, the skin becomes dark, dusky, and very painful; there is gangrene and some loss of skin and subcutaneous tissues upon warming. In the fourth degree there is never any warming -- the skin remains cold, dark, and dead, and the affected part is usually lost. In general the disappearance of pain from the affected area with development of a whitish or grayish color and loss of sensation, indicates the onset of frostbite.

The best treatment is prevention, through adequate clothing. Where there is high risk of a rapid cooling of skin and extremities persons may protect their extremities by placing feet in one another's armpits, their hands in their crotches, and so on. It is of equal importance to keep the core of the body warm to assure continued and adequate circulation of blood to the extremities.

Treatment involves, first and foremost, the application of warmth to the affected area. NEVER RUB WITH SNOW. And after a frostbitten area has thawed, KEEP IT WARM: SUSCEPTIBILITY TO RENEWED FROSTBITE IS MUCH GREATER ONCE AN AREA HAS BEEN FROSTBITTEN AND THAWED. If there is danger of a renewal of frostbite after thawing, and the affected area is a foot, do not thaw the foot before evacuating. A person can walk a long way on a frostbitten foot; a thawed foot that is frostbitten again during an evacuation may be permanently lost.

7. Heat exhaustion

Symptomized by cold and clammy skin, faintness, weakness, and nausea, this condition resembles acute mountain sickness and is treated similarly. It is most likely on hot days when a mountaineer or canoer experiences intense exertion and perspiration.

8. Sunstroke

An overheating of the body through excessive exposure to the sun may provoke the circulatory system to respond with circulation of too much blood in an attempt to cool the body. Symptoms are a flushed, hot face, rapid, full pulse, pain in the head, weakness, dizziness. Provide rest in a shaded area, cool liquids, and external cooling of the body.

9. Muscular cramps

Caused by a buildup of lactic acid in muscles through overexertion. Rest will permit the blood to carry the lactic acid away. In addition administer salt to dispell dehydration, breathe deeply, and stretch the affected muscle.

10. Snowblindness

Caused by failure to use adequate dark glasses during brilliant sunshine on snow, light-colored rock, or reflection from water. The eyes become painful and bloodshot. To treat, apply cool, wet compresses to the eyes, then have the subject wear two pairs of dark glasses. Aspirin controls the pain. Sometimes it is necessary to cover the eyes and lead the casualty out by hand. Recovery may take 2-3 days. Holocain hydrochloride ointment relieves the burning and pain but does not improve vision and should not be used longer than absolutely necessary because of risk of damage to the cornea.

11. Blisters

Result from abrasion of the skin, usually against socks when boots are too loosely laced and permit the foot to move around, or too small and result in rubbing. The most common and troublesome of health problems on expedition, they require prompt treatment. At the first sensation of pain, the affected area must be inspected and covered by a wide strip of adhesive tape if it is only a "hot spot". It is well to apply moleskin first, cutting a hole slightly larger than the affected area before applying. Then tape may be applied over the hole.

Preventive care is best. Many people tape potential blister areas before beginning the hike or activity. A blister should be broken only when absolutely necessary, because of risk of infection. If it must be done, wash the affected area, and your hands, with soap and water and puncture the blister with a needle sterilized in a flame. To puncture insert the needle under the skin just beyond the blister's edge. Then gently press out fluid and cover with a sterile dressing. If a blister has already broken, wash and bandage it similarly. Watch carefully for subsequent infection.

12. Infection

Occasionally small, or large, wounds may become infected in the field. Prompt attention is necessary, lest a minor infection

develop into a disabling injury requiring evacuation. Contaminated water may cause infection of cracks in the skin next to the nails, or in tiny cuts or scratches that can rapidly fester into serious problems.

Immediately upon spotting an infection, clean it with soap and water or PHisohex, and apply Neopolycin or another anti-infection medication. It is wise to begin ingestion of proper dosages of antibiotics, if the infection does not respond to cutaneous medication. Once having begun on anti-biotic continue to medicate at the prescribed level; no good is accomplished unless it is maintained in the bloodstream. And examine the infection at least once daily. In some cases lancing with a sterilized needle, and the application of pressure to squeeze out pus, may help. It is a good idea in such instances to soften the infected area by applying a hot compress before lancing. Cleanliness is of utmost importance, as is the application of medication and a sterile dressing.

OFFICE PROCEDURE FOR SERIOUSLY INJURED OR MISSING STUDENTS OR STAFF

Injured Participants

Assure that first aid has been administered.

Convey injured to medical treatment center with their health and insurance forms.

Call hospital emergency ward.

Call parents if it is warranted, as if the injured is going to be admitted to a hospital.

In the event of death, notify Sheriff, Coroner, our office, and the next of kin. (You may call immediately upon learning of potential situation and tell next of kin that the participant has been "seriously injured", then return the call when it is official.)

If it is necessary to deploy a rescue group, the faculty leader should be the coordinator and remain in charge in situ while providing for communication. Information to the news media, strangers, and so on should emanate from this person alone unless he delegates such authority to another. We do not want people hearing or reading about injuries to their children through public communication before hearing from us.

FIELD ACCIDENT PROCEDURE

Follow exactly:

Assess the situation. Keep cool. Decide exactly what steps to take before acting. Start a written log in duplicate.

Administer first aid to victim. Do nothing to add to his injuries. Refer to first aid chapter. Reassure the victim and do not discuss his condition within hearing distance.

Select a messenger party to go for help. Obey ground rules as to size, procedures, mapping, logging.

Send with messenger party a completed log of steps taken to point of departure, with marked map showing exact location of victim.

Messenger party should:

Carry essential equipment (map, compass, flashlights, food, water, matches, protective clothing). Prepare for a night out or getting lost. Copy down emergency phone numbers from first aid kit.

Remain calm. Hurry, but without risk of further accidents.

Keep together.

Observe, mark and map - marking map - your route out.

Retain strength to lead rescue party back, if needed.

Notify rescue squad, medical authorities, and the Program office.

Persons staying with the injured should:

Assure his comfort, maintenance of body heat and temperature and protect from the elements.

Set up a temporary camp.

Prepare food and hot drinks for the group members.

Assign a person to remain with victim at all times.

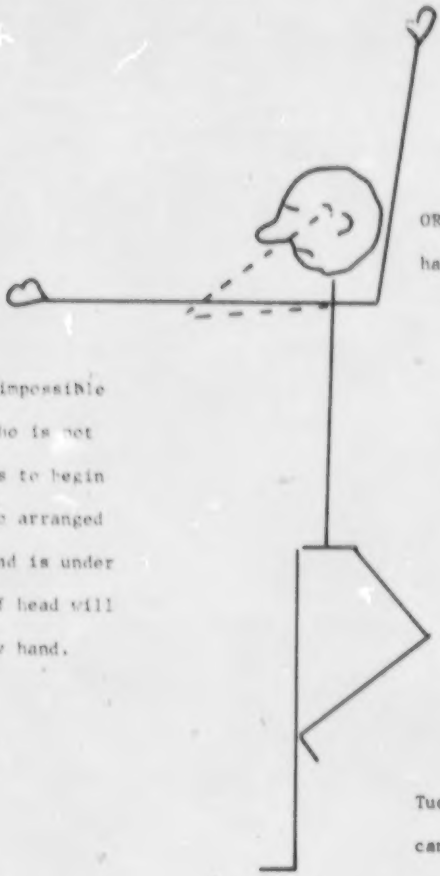
Watch the victim constantly until rescue party arrives - keeping an eye out for:

cessation of breathing
recurrence of bleeding
cessation of heartbeat
blockage of air passageway by blood, vomit, tongue, etc.
signs of shock

Remember that the administration of food and water will depend on the general condition and nature of injuries of the victim. If the nature of injuries and general condition point to surgery upon arrival at a hospital, or immediate evacuation, consider that patients rarely receive food or fluid prior to surgery.

Position in which to leave an injured person, if must be left alone, is comatose, and it is safe to change position:

Place subject prone, on stomach, thus



OR: place left hand under face

It is all but impossible for a person who is not fully conscious to begin to get up if so arranged and if left hand is under head, a fall of head will be cushioned by hand.

Tuck foot so cannot move

WILDERNESS FIRST AID LIST

Item	Faculty Kit	Patrol Kit
Band Aids (1" wide)	10	25
Sterile pads (3 x 3")	5	10
Adhesive tape (1" roll)	2	2
Ace bandages (3" wide)	1	2
Moleskin (1' x 2')	1	1
Inflatable leg splint	1	1
Inflatable arm splint	1	1
Small scissors	1	1
Aspirin for: pain, swelling, fever, inflamation dose: 2 every 3/4 hours as needed	100	100
Darvon Compound 65 for: severe pain dose: 1 every 4 hours as needed	25	-
Erythromycin (250 mg) for: infection; use with reservation dose: 1 every 6 hours	25	-
Morphine (1/6 gr) for: severe pain, fracture shock dose: given subcutaneously (by needle)	1 unit	-
Lomatil for: diarrhea, abdominal cramping dose: 1-2 tablets before meals 3 times a day	25	-
Polymagma (tablets) for: diarrhea dose: swallow 4 tablets (do not chew) on first dose; then 2 after each liquid bowel movement	-	150

WILDERNESS FIRST AID LIST (con'd)

Item	Faculty Kit	Patrol Kit
Dramamine (50 mg) for: motion and mountain sickness; nausea, vomiting, dizziness dose: 1 every 4 hours	30	-
Phenergan for: rectal anti-nausea suppository dose: 1 every 4 to 6 hours as necessary	12	-
Furacin (burn ointment) for: minor surface bacterial infections or wounds dose: as needed; do not get on healthy skin-will destroy	1	1
NeoPolycin (antiseptic cream) for: cuts, blisters, etc. dose: apply twice a day	1 (1/2 oz. tube)	1
PHisohex (antiseptic soap) note: do not use over huge area without doctor's advisement; wash off well	1 (2 oz. bottle)	1
Peppermint candy for: nutrition of grossly injured while being evacuated	1 lb.	

SEARCH AND RESCUE PROCEDURES

No matter how carefully safe hiking procedures are followed, anyone who spends a lot of time in wilderness areas can expect misfortune sometime. The fact that it is a wilderness area will mean that the primary responsibility for dealing with the situation will rest on the members of the hiking or canoeing group. Earlier sections of the manual cover safe travel practices and first aid care. This section will cover only search procedures.

It is usually more important that the action be correct than swift. Think through everything before taking action. If there is not a leader already in charge, appoint one. Then follow his directions carefully and strictly. Write down all decisions and actions, in duplicate or more, so a copy is with each party involved in search procedures. Remember, once voice contact is lost with another person in the wilderness, control over each other's actions is also lost.

Not only should instructors be acquainted with the principles of this section, they should have a discussion with the students covering the main points. Any time which seems appropriate is acceptable, but a review should be held just before the final expeditions to be sure the students will know what to do in case of an accident during that period.

We will first list some general guidelines and then in separate sections deal with the specifics of search in the mountains and on water.

1. Observe the 9:00 rule in determining whether someone is missing. This rule is that if a party is delayed in reaching a destination, they are to get there personally or get a message there in writing, explaining their situation not later than 9:00 the next morning. If there is no word by that time, it will be assumed that a mishap has occurred and search and rescue procedures will be started. Obviously, situations may arise when it is clear that this rule is not applicable. Common sense, mature judgement and experience should be your guide.

2. Search parties should take sufficient gear to permit making an emergency camp if necessary. This will include food, shelter, and first aid supplies. There should be a clear understanding as to the time the search party will return to base camp. If there are enough people, and the route of the missing warrants, two search parties may be dispatched on different routes. All plans must be in writing, and copies given to each party and the leader. Marked maps may be used in some situations.

3. A written log should be kept, recording the exact sequence of events and times, decisions made, reports received, etc. If outside aid is called in, an exact copy of the log should be given to the leader of the outside rescue party.

4. If a decision is reached to call in outside aid, the following is a list of the things the leader of a rescue group will want to know.

(a) Nature of help required - lost or accident?
(b) Where the base camp is and how many people are there, and their condition.
(c) How many people are lost (injured).
(d) When and where the accident occurred or the group got lost.
(e) Where the messenger is, so they can meet to return to base camp.

5. After help is assured, and preparations are started, the messenger should personally inform the Wilderness office and the relations of the persons involved. The necessary phone numbers, addresses, etc. are in the student first aid kits. If one of these is with the lost party, the necessary phone numbers can be gotten from the Wilderness office.

Search and rescue on the water program.

1. In advance:

A. Notify the Ontario Provincial Police as to the put-in points and expected route for both expeditions. In case of emergency they will then have some idea of where to look. There is a post on the south side of Rt. 11 at Emo, just west of Ft. Francis.

B. Each expedition should have in writing, the itinerary for the other expedition.

2. Search procedures.

There are two very different kinds of search which may be required. If an individual is lost, a ground search must be made in the area he was last known to be. If a brigade or expedition does not arrive when expected, at a checkpoint, a different approach is needed.

A. If an individual is lost from camp, on solo, or on a portage, follow these steps.

1. Establish the known facts - who is missing, last place seen, approximate length of time missing, condition when last seen.
2. Do a route search if this is applicable (e.g. on a portage). Otherwise organize an area search with all available personnel. It is most unlikely that you will be able to see more than a few feet in any direction in the forested areas, so great care is needed to be sure a possibly injured person is not missed in the undergrowth, or that some of the searchers do not get lost. All plans must be carefully made, written down, and followed exactly.
3. If this is unproductive, outside aid is probably required. This involves a crew paddling out and notifying the OPP, who can either themselves aid or contact the proper groups, depending on the location of the rescue effort. The program office and the parents of the missing should be notified at the same time. Once outside aid is called in, they will assume overall direction of the efforts.

B. Loss of a brigade or expedition:

1. Establish the known facts of where they were last known to be, approximate time elapsed, weather conditions, etc.
2. Study the route they were to take. Look for possible navigational errors, alternate portages, stream branches, etc. If there is a large lake involved (e.g. Otukamamoan) it is often wise to do a perimeter search, to explore the various arms, bays, and islands. Examine portages, or likely bust sites, for signs of recent passage. If signs are found note which direction travel seems to have been.
3. In the unlikely event that this is unproductive, contact outside help. An air search will probably be in order. Follow steps outlined in A. 3.

Search and rescue in the mountains:

1. In Advance:

   A. At Vernal check with USFS office on location of wilderness rangers, who must be contacted if evacuation becomes necessary, and who will be able to make radio contact with either the Vernal sheriff's rescue unit or the helicopter from Hill AFB at Salt Lake City.

   B. Before entering the field, leaders are to file in writing at local ranger station itineraries for all mountain expeditions, indicating starting points and dates, solo and resupply points and dates, and final destination and dates.

2. Field search procedures.

   A. Observe the 9:00 rule. Plan and organize search teams.

   B. The initial effort should be a route search, with a party traveling the planned route of the missing, using marked maps as guides.

   C. When a route search has proven unproductive, (within not more than 24 hours of its beginning) expedition leaders should notify the Forest Service, Sheriff, Highway Patrol, program office, and parents of the missing.

   D. The search will next widen to become an area sweep with all available expedition personnel, who should have been assembled to coordinate efforts. The same procedures and precautions will be taken as with the route search.

   E. With the arrival of rescue personnel from outside, a general search will commence. The search will halt only after reasonable efforts have been extended.

ROPES, SLINGS, AND KNOTS

While caravans are proceeding to their respective field sites, instructors may wish to familiarize students with the use of sling material, ropes, and the knots that students must learn while on expedition. Instructors should emphasize the importance of mastering the knots as quickly as possible. Knots which students must learn include the following:

1. Bowline--both the quick, one-handed method, which students should be taught to depend on, both because it can be tied with one hand, or in the dark or emergencies, and because the hand movement is so distinctive that an instructor standing many feet away can tell whether a student has tied-in properly. Also slow method.

2. Bowline on a coil--to be taught after students have thoroughly

mastered the other version of the bowline and to be demonstrated as a knot whose use with the coil is to cushion the waist of the climber when he ties-in.

3. Double fisherman's knot--this is the only knot allowable for joining the ends of two ropes.

4. Figure eight knot--for tying a loop into the middle of a rope.

5. Water knot--for sling material. This is the ONLY knot approved for tying the ends of sling material together. A bowline will absolutely not hold in sling material; only the water knot generates sufficient friction to be reliable.

6. Triple half hitch may be used to anchor a belayer to his anchor with a carabiner snapped through the terminal loop.

Students need also to be taught how to uncoil and stack a rope, the proper way to throw a rope down a slope, proper rope care, and the proper way to recoil a rope after use. They should become aware that it is sometimes necessary to walk out a rope if it has been coiled for a long time and has become kinky.

Instructors will need to emphasize that students must REMEMBER NEVER TO STEP ON A ROPE. Stepping on ropes grinds dirt and small pieces of rock in between their fibers, damaging the rope. This seriously reduces the life of the rope, with an accompanying increase in risk to climbers. In addition to stressing this point, instructors will need to stress that ropes are not thrown down slopes unless they are first properly stacked, and that it will be necessary to make certain that one end of the rope is anchored before any of the rope is thrown. Stories are legion about climbers, especially beginning climbers, who have thrown an entire rope over a cliff to their later regret.

Students should also be told that it is not appropriate to store a rope in sun light. Ropes are made of a nylon material, and the life of that is shortened if it is left out in the sunlight for any considerable period. Students should also be taught the importance of inspecting the ropes, of making certain that both ends and midpoints are marked, ends whipped or fused together, and that ropes unsuitable for use are identified by painting their ends black. Students should also be taught that ropes may be washed gently in a washing machine after use, and that clean ropes are best for use. Where a rope is in use, if it angles steeply over the top of a cliff, it is desirable to place a shirt or coat or some other cushion between the rope and the jagged brink of the slope, so as to minimize wear.

Sling material need not be treated with quite as much care as ropes, but students should learn always to coil their slings and wrap them with rubber bands or some other wrap after use, so that they may be used more readily and so that they do not become kinky. Once a student has placed a water knot in a sling to adjust the sling size to fit his body, he may wish to leave the knot in. With slings, as with ropes, students should learn to tie-off with over-

hand loops, any excess beyond the knot used to tie them in.

CLIMBING, INSTRUCTION, AND SIGNALS

It is impossible either to teach or to learn climbing through the written word. Climbing is an activity that can be mastered only by means of experience, observation, and through the criticism of careful and attentive instructors. Nevertheless, all instructors on the Wilderness Program will be expected to have read and submitted essentially to memory material contained in two publications. The first of these is Walt Wheelock's pamphlet ROPES, KNOTS AND SLINGS FOR CLIMBERS, and the second is Royal Robbin's pamphlet, BASIC ROCK CRAFT.

In general, as instructors prepare to teach and supervise climbing, they need to remind themselves of the role of climbing in the Wilderness Program. Climbing is primarily a means to an end, rather than an end in itself. It is a means of enabling students to test themselves, and to discover that, despite great fear and uncertainty, they can do more than they thought. It is, in short, one of the most important devices by which we stretch our students, and, by granting them hard won successes, enhance their self-confidence.

It is crucially important that the climbing experience be conducted with safety, but at the same time under circumstances which allow students to feel considerable danger and fear. Instructors will need to be particularly attentive to the emotional condition of their students. They will need to be willing to demonstrate to the students that the systems do work, but they will also need to be willing here, as perhaps nowhere else, to be firm as well as supportive. We expect all students to complete the climbing assignments, and in the course of meeting that expectation it will undoubtedly be necessary to explain to some students that the designers of the program do not expect everyone to enjoy everything, but do expect everyone to try everything, and learn that they can succeed at it. It is only through trying new experiences that we test and extend ourselves, and open ourselves to the possibility of new kinds of activities. When students object to climbing on aesthetic grounds, one may be able to point out that climbing is in itself an aesthetic and movingly beautiful experience.

One of the best strategies for getting students into climbing is, in the course of hiking from day to day, to invite them to go bouldering when suitable boulders are encountered. It is through bouldering that they may learn the basic principles of rock climbing such as three point balance, placing the weight firmly on the feet and maximazing friction between the feet and the rope. The legs contain the most powerful muscles. The climber should, therefore, depend primarily on his thighs to lift him. A climber needs to consider balance at all times and should attempt to think two or three moves in advance. The way to maximize friction and balance is usually to keep the buttocks away from the cliff rather than hugging it. While bouldering, beginning climbers may also

experience and learn the basic principles of friction work, and should come at least to know what the names of the basic moves are and how to execute some of them. These moves should include not only normal uphill climbing, but also manteling; jamming in cracks by use of feet, knees, elbows, fists, or perhaps even the whole body in a sufficiently large crack; and perhaps even something of chimney technique and, if suitable rock is available, lay backs.

Upon reaching the climbing site instructors will want to assure themselves that students have mastered knots. This may mean classes in knots, belaying, and signals on the level, at camp, on previous days, and a review immediately before the initial climb. Upon reaching the climbing site it is necessary, therefore, only to check student's knots.

Rappelling is an excellent way to learn to trust rope systems, for a student must depend on both his belay and rappel ropes, and on himself, too. Rappelling brings him/her most directly face to face with his/her fear. Rappelling is also a direct lesson in human interdependence, and in the sort of community that comprises a climber and his belayer. The climber depends on the belayer for his life, and at the same time the belayer knows that he holds the climber's life in his brake hand. Instructors should first demonstrate the techniques of climbing and rappelling.

Leaders may wish to practice rappelling techniques on a low or moderate angle slope. The first rappel may be a body rappel. We aim to teach both the body rappel and the technique of rappelling through the use of a Swiss army seat. The simpler system should always be taught first, and students should learn that there is much less possibility of failure in a simple system than a complex system. They should also learn, however, that it is possible to flip out of a body rappell if one leans back too far, whereas that danger is not present through the use of a Swiss army seat. Through rappelling then, students learn many things, including control of themselves, the importance of maintaining adequate contact with the slope so as to maximize friction, (putting weight on feet by leaning out), trust in the belayer, trust in the rope system, and trust in themselves.

Instructors may also want to set up high rappels, up to one hundred fifty feet, and if possible on overhung slopes, so as to add an additional element of excitement to the experience for students. A free rappel is useful also to show students how much friction they generate in rappelling, and that it is possible to stop through using only the brake hand.

The use of multiple top belay systems allows instructors to provide students with beginning climbs of varying degrees of difficulty and to attempt to match those climbs with the abilities of the students involved. Naturally, whenever a rope system is set up, the belayer and the climber or rappeller will both want to ascertain that the system has been properly organized, and that both belayer and climber are properly tied in. Belayers and climbers must learn that these are their responsibilities.

It is generally a good idea to observe students closely while they are climbing, so as to caution them against the more obvious mistakes of beginners. These include 1) the use of the knees- the tenderest and most sensitive parts of the body and vital joints in the success of any climb, 2) a tendency to hug the rock too closely and thus to lose some of the friction that can be generated by putting the weight more directly on the bottom of the feet, 3) a tendency to freeze up, or 4) to fail to look sufficiently far ahead to spy out a route. Instructors should be prepared to coach students as they climb, just as when they first rappel, but not in a way that reduces the students' sense of achievement. Indeed it may be necessary in some cases for instructors to rappel or climb beside students, if students become particularly fearful. If a student can be encouraged to complete his rappels and his climbs he will discover that his sense of success is directly proportionate to the amount of fear and apprehension he felt.

Instructors may wish on the evening of the first rappels and climbs to arrange for campfire discussions. Such sharing sessions do a great deal to build a group's spirit, and to open students to one another. The barriers that separate people break down as students discover that all of them in varying degrees felt fear, apprehension and uncertainty, and that all of them felt a certain sense of achievement upon completing the task. Such conversations not only have a drawing together affect, but they can be profoundly sensitizing for their participants, who learn to reach out to one another, and to verbalize about their innermost feelings, as well as to recognize their common humanity, and their dependence on one another.

CLIMBING SIGNALS

These are the only ones used. The use of others will result in confusion and thus increase risks.

C = climber
B = belayer

*B (Before throwing rope) "Rope"	(for rappelling) "Rope".	
*B "Belay on."	*B "Belay on."	
	*C "On belay."	
*C "On Belay"	*C "Rappelling."	
	*B "Rappel."	
C "Up rope."	*C "Off rappel."	
B responds with rope	*B "Thank you."	
C "That's me."	*C "Off belay."	
B "Thank you."	*B "Off belay."	
*C "Climbing." (Climbing begins only	*C "All clear."	
*B "Climb." at this point)	*B "Thank you."	

C "Resting."
B "Rest."

C "Testing."
B "Test."

C "Up rope."
"Slack."
"Tension."
"Falling."
B RESPONDS INSTANTLY WITH ROPE. NO ORAL SIGNAL

C "Climbing."
B "Climb."

*C "Off belay."
*B "Belay off."

NOTE THAT BELAYER INITIATES AND TERMINATES CONTACT IN EACH CASE.

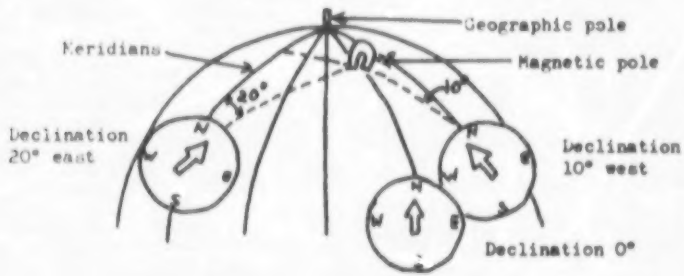
*Signals to be used with every climb. Others used as needed.

NAVIGATION

by Al Kesselheim

In order to travel efficiently in the wilderness, one must be versed in map and compass techniques. During the program, students should be taught to orient a map both by using the compass and by looking at landforms, take cross bearings or triangulations to determine their approximate position, follow a compass bearing, and be used to interpreting landforms on topographic maps. One sure way to get students to practice these skills is to have them bushwhack across country. Another device that may be helpful is to ask students to draw a topographic map of a landmark or even a part of their body.

The compass we use has a magnetized needle which floats in liquid and can respond freely to the magnetism of the earth. This compass needle points to the magnetic north pole (in northern Canada) rather than the geographic north pole. The angle of difference between true (geographic) north and magnetic north is called declination. This changes in different parts of the world.

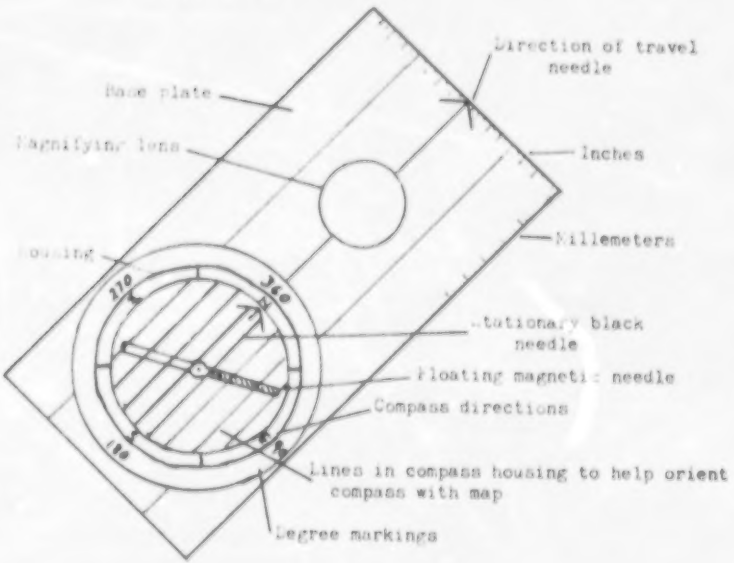


Taking a compass bearing is simply measuring in degrees the angle measured clockwise from north to the desired direction of travel. If you are facing due north the angle (bearing) is zero degrees. If you are facing east the angle is 90 degrees, and so on. You may read bearings either as magnetic bearings using magnetic north as the zero bearing, or true bearings using true north as the zero bearing. It is necessary to be consistent, however. If the declination is 16 degrees east, as it is in the Uinta Mountains, you need to correct for it by turning the rotating compass housing 16 degrees clockwise, thus subtracting the necessary amount. You will then be reading a true bearing.

A good memory device for remembering whether to add or subtract the degrees of declination for the bearing is:

East is least (-) and west is best (+) and never the twain shall meet, except in Richmond where magnetic and true north happen to be on the same line. So when the map (as in the Dryden area) ways the declination is 7 degrees E., you subtract 7 degrees from the magnetic reading to arrive at the true bearing.

Compass Parts Diagram



A Silva compass with a floating needle and magnifying glass

The Wilderness program uses only topographic maps which depict landforms using contour lines to show elevation change. The water program uses the United States series topo sheets with a scale of 1: 250,000 or approximately 1/4 inch to 1 mile. The mountain program uses the more detailed 7 1/2 minute map series with a 1:24,000 scale or approximately 2 1/2 inches to a mile. The area covered by a 7 1/2 minute sheet is about 6 by 9 miles. The contour interval and magnetic declination will be printed on the bottom of each quadrant, along with other important information.

Each color on topographic maps represents a different type of feature: blue stands for bodies of water, black for man-made features, (buildings, trails, etc.), brown conotes elevation marks, and green is for forested areas. A contour line is an indicator of all the points in an area that are the same level. It is customary to make every fifth line heavier. This aids in keeping track of a particular line when reading. The vertical distance between any two lines is the contour interval for that map. Common intervals are 20', 40', or 100'. The closer together the lines, the steeper the slope. Closed circles indicate tops of hills or mountains. Contours along stream beds will form V's pointing upstream and along ridges pointing down slope.

Orienting maps by the lay of the land requires some practice. In the mountains, where prominent landforms are almost always somewhere in sight, orienting the map should present no large problem. However, in some cases it is difficult to be precise, so for the sake of accuracy it is wise to use the compass. This is done by placing the compass on top of the map on a flat surface with the straight edge of the compass along the north-south line on the map. Then turn the map and compass together until the compass needle is aligned with magnetic north as shown on the map. Now there will be direct conformity between the map bearings and bearings observed by sight in the area.

If you know where you are on a map, you should be able to find any landmark on the map or be able to transpose any landmark in sight onto your map. If you know you are at a certain river fork and want to find a peak on your map, simply take a compass bearing to the peak and plot that bearing on your map. The line should extend from where you are to the correct mountain top. When you know only your position along a line (ridge, river), you can find your position by sighting a known point and plotting that bearing on the map. The place where it crosses the line you are on is your position. When you know only the general area of your position, it is necessary to sight several points to determine your exact location. If you are sure of two landmarks, peaks for example, take a bearing on each and plot them on your map after having oriented the topo sheet. Where the lines cross is presumably your position. (This is known as taking a cross-bearing.) However, this method tends not to be as accurate as you might like. It is always best to sight three bearings to establish your position (triangulation). Using this method you end up with a triangle of error within which you stand and can be pretty certain of its accuracy.

Often it becomes necessary to take a good hard look around in order to interpret your position. Being observant is a must because the country changes with each step or paddle stroke. In most areas of Ontario the variation in elevation is too small to be of much help in map reading. The only successful method of orienting yourself to the map is to keep track of approximately where you are and then use islands, bays, and headlands to orient yourself. In crossing large lakes, especially when there are lots of islands and when there is a wind, it is wise to follow a compass bearing to cut to a minimum the confusion of the many islands or the probability of being blown off course.

We all know that getting lost isn't allowed on the program, but in some cases you might become temporarily confused. The first thing to do when confused is to stop. The second is to go back to the last known position (trail, known river, etc.). If you are unable to go back and have an approximate idea of your position, proceed slowly, watching landmarks and taking compass bearings when possible. If your position is unknown to you, stay where you are! Shout for help, listen, stop and look around. Don't go running around frantically getting more and more lost. Scout out from your position in all directions, each time returning to your marked position. If you have to bivouac, you will undoubtedly be found the next day when the rest of your party begins its search. Perhaps the most important thing to remember is to stay calm. Don't panic. Sing, try to remember books you've read, people you know, anything.

Wilderness navigation, with some practice can become a satisfying and enjoyable pastime as well as a necessary skill. Being sure of yourself, not cocky, in a natural environment is a privilege not to be taken lightly.

Note: Much of this text was stimulated by: Mountaineering: Freedom of the Hills ed. Ferber.

WEATHER

by Alan Fesselheim

Weather is created by various processes connected with the atmosphere. The atmosphere is hundreds of miles thick, but for the purposes of studying weather we are only concerned with the part of the atmosphere closest to the earth. This first atmospheric layer (about 5 miles thick) is known as the troposphere and is the location of all but the very highest cloud formation. The troposphere is quite dense in comparison to the rest of the atmosphere, accounting for over half of its total weight.

1. Climate is the general weather patterns of an area as defined by latitude, temperature, and precipitation. The climate is largely determined by the position of the sun relative to the earth. We are concerned with the temperate climatic zone in our study. This zone is characterized by seasonal weather patterns with highly fluctuating temperatures from season to season and frontal confrontation resulting from the meeting of cold polar air masses moving south and warm tropic air moving northward.

2. Clouds are formed in one of 2 ways; either by rising air currents which produce billowy shaped cumulus clouds, or by air reaching its saturation point without vertical movement, forming sheet-like stratus clouds. Clouds are classified into three types as defined by altitude level.

The highest level of cloud formation is in the upper troposphere (25-30,000 ft.). Clouds formed here are made up totally of fine ice crystals and are called cirrus clouds. True cirrus clouds are thin and wispy, often looking like mares' tails or fine comma-like fragments. Cirrocumulus clouds are fairly rare and have a ripply look like ripple marks left in sand by water. They have more body than the cirrus mares' tails and tend to appear in concentrated areas rather than being scattered. Cirrostratus are the lowest cirrus type cloud, forming at 20-25,000 ft. They appear as fine sheets that look like gauze or haze. When halos appear around the sun or moon it is usually a result of the effect cirrostratus clouds have on the light.

The middle level clouds, forming at about 10,000 ft., are known as the alto family. Altostratus clouds are dense grey or blue veils that cover large portions of the sky at a time. They sometimes appear fibrous or striped. The sun shines through altostratus clouds as though through frosted glass. The other alto-type cloud, altocumulus, appears in layers and patches of puffy clouds and is made up entirely of water droplets, rather than ice.

The lowest cloud level occurs at about 6,500 feet and is known as the stratus family. True stratus clouds are heavy, uniform, and fog-like. They may sometimes even touch the ground, but usually burn off in the morning. They create a heavy sky and may sometimes be responsible for fine drizzle. Nimbostratus are the true rain clouds. They create a leaden sky and you can often see streaks of rain descending from them to the ground. Stratocumulus clouds appear in low, rolling, puffy layers, often associated with high winds. They don't usually produce rain, but they may turn to nimbostratus which will.

(25-30,000)'		
cirrus	cirro cumulus	cirro-stratus
	"mackerel scales"	high sheet-like
(10,000)'		
alto	alto cumulus	alto-stratus
(6,500)'		
stratus	strato cumulus	nimbo-stratus

General Cloud Rules:

A. High or middle clouds from the south are an indicator of deteriorating weather. Movement from the north indicates fair weather except occasionally under an arctic air mass in the winter.

B. Low clouds from the south indicate deterioration in the weather, especially if they are fast moving. Low clouds from the north indicate fair or improving weather.

C. Without clouds, strong north winds mean good weather.

3. Weather, for the most part, is caused by frontal interaction. In the temperate zone, the major fronts are made up of cold polar air moving southward or warmer air moving northward from the Gulf of Mexico or Pacific Ocean. The confrontation of these two air masses produces clouds, precipitation, and low pressure zones. In our area these fronts tend to move through in about 3 day cycles, but this rule is quite general. When the warm air dominates and pushes out the cold air mass, it is called a warm front. A cold front is produced when the cold air dominates. Cold fronts move about twice as fast as warm fronts and will sometimes overtake a warm front from behind and lift it off the ground. This phenomenon is known as an occluded front. When a front is held in place over an area it is referred to as a sationary front.

4. The low pressure zone along a front is the area in which the cyclonic storm cell may develop, producing deteriorating weather. The winds around a low pressure center will always move in a counterclockwise direction. One good forecaster of poor weather is the shift of wind in a counterclockwise direction.

5. Precipitation is mainly a matter of water vapor in clouds becoming heavy enough for gravity to exert enough downward pull to make them fall. Initially clouds are formed by warm air rising from the earth and expanding because of decreased atmospheric pressure. This expansion has a cooling effect. Once air has cooled below its saturation point, the water vapor condenses to form clouds. This is the same phenomenon that causes "clouds" when you breathe in winter air. These original water droplets which form clouds are so tiny that it would take them 16 hours to fall half a mile on a still day. Through coalescence, droplets merge with each other until they are large enough to be affected by gravity. Coalescence is a combination of ice crystal growth and the process of collision and merging of water droplets.

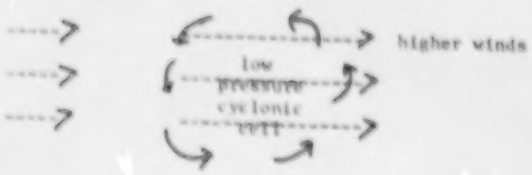
6. Cross-winds rule:

A. If you stand with your back to the ground winds and the higher clouds are moving from left to right in relation to you, weather will usually deteriorate.

B. If, with your back to the ground wind, higher clouds move parallel to you, weather will remain stable.

c. If, with your back to the ground wind, higher clouds move from right to left, weather will usually improve.

(Unfortunately, this rule is not especially useful in mountains due to valley winds and obstructions.)



Mountain Weather

The most predictable thing about mountain weather is its unpredictableness. The rising and falling air masses, high altitudes, and often blocked vision all contribute to this. Because of the altitude difference between mountain areas and the surrounding area, mountains are literally climatic islands. They also exhibit dramatic climatic zones within their boundaries evidenced by vegetation change and corresponding altitude change.

Air masses are forced over mountains by winds. As air rises it cools at the rate of about 5 1/2° per 1,000 feet. As it drops down the other side of a mountain it warms at the same rate. If while rising, air reaches its saturation point, clouds will form. Air that is at 54 degrees at 5,000 feet will have cooled to about 30 degrees by the time it has gotten to a 12,000 foot mountain summit. This is known as adiabatic temperature change.

Another phenomenon associated with mountainous terrain is known as mountain and valley winds. As slopes are warmed during the day, air near the ground is heated and rises, creating an upslope wind. At night the peaks cool more quickly than the valleys, and winds then travel down the valley to the cooling lowlands.

Western Mountain Weather Tips:

1. Bad weather usually comes out of the south-southwest.
2. Cloud caps on mountain tops indicate a cold and windy summit.
3. Growing and descending lenticular clouds may forecast bad weather.
4. High mares' tails are often the earliest warning of bad weather.
5. Never take mountain weather for granted!

General Weather Tips:

Indicators of good weather:

1. Dots of cumulus in the afternoon sky.
2. Morning fog that burns off by noon.

Indicators of bad weather:

1. Cirrus clouds that are banded and begin to thicken; usually followed by lower clouds.
2. If there is a ring around the moon (cirrostratus).
3. Puffy cumulus clouds that begin to develop vertically.
4. Wind shifting counterclockwise.

Clearing weather:

1. Clouds rising to higher types.
2. Winds shifting to west.

Three folk adages about weather which are helpful are:

1. Mare's tails and Mackerel scales
   Make tall ships carry small sails

2. Rain before seven, clearing by eleven.

3. Red sky in the morning, sailor's take warning
   Red sky at night, sailor's delight.

FISHING

All expeditions are expected to teach the fundamentals of fishing. It is a fine sport which is enjoyed by millions in all parts of the world. It also allows the possibility of adding variety to the diet and is a skill which is important for wilderness living.

The equipment our program uses is chosen for portability, ruggedness, and appropriateness for the kinds of fishing most likely to be successful for the areas and time of year. Both fly and spin casting equipment are taken to the mountains. We do not take fly casting equipment to Canada since in the late summer fly casting in the lakes of Ontario is almost certain to be a waste of time.

As with our other equipment, students should be taught proper care of the fishing gear. A session should be scheduled when the rods are shown and the parts and their purposes are described. At that time it is important to emphasize the proper way to assemble and disassemble the rods. Have the students practice this. Some general rules on equipment care are:

1. Keep equipment clean, especially ferrules and reels.
2. Do not put wet equipment in airtight containers.
3. When practicing fly casting, use level leaders (not tapered).
4. Do not cut fly line, use standard knots.
5. When disassembling tackle, remove the lure from the leader, and the leader from the line.
6. Never lay the rod on the ground, lean it against a bush, tree or rocks. (Break this rule at your own risk)

A few special safety precautions are necessary in fishing.

1. Clear the area, both when practicing and fishing. This is common courtesy.
2. Practice casting without hooks - especially fly casting.
3. Wear glasses when fly casting.
4. Never put your fingers in the mouth of a Northern Pike if you catch one.

In Canada three main types of fish are common in the late summer: Walleye, Smallmouth Bass, and Northern Pike. Each has its favorite area and time for feeding, which is the guide to where they are most likely to be caught.

Fish	Where	When	Lure
Walleye	stream mouths, falls, rapids	9 PM-2 AM	jiggs or Mepps
Smallmouth	around rocky islands shore line	daytime	Mepps with slipshot
Northern	shallow grassy, reedy areas	early AM & evening	Daredevils

Comments:

Walleyes feed in schools, are active when it is overcast.
For Bass, cast from the canoe toward land, aim for 3" from shore.
Northern, has lots of very sharp teeth, always use a wire leader and keep fingers out of the mouth of any you catch.

The most common fish in the mountains is trout. The native trout of the Uintas was the Cutthroast, identified by the red slash beneath the lower jaw, but now most lakes and streams are stocked. These are usually the Eastern (Brook) Trout, which have a series of red spots on either side; German or Brown Trout; Rainbow Trout, with a pink stripe down each side; and occasionally Golden Trout. No matter which kind or where they are, they tend to be limited in number. Their reproduction rate tends to be low. Since they live in oligotropic waters the food supply is limited. They usually feed on insects, both larval and flying forms, many of which are aquatic. Observe the insects that are around the waters and choose a fly that resembles them for the best results in fishing. They are most often caught in the early morning and the evening.

Whatever fish are caught the following conservation practices should be followed. Unless they are severely undernourished (thin bodies with large heads) kill only what you need. Remove the hook with dry hands, and when returning any fish to the water do so gently.

The following equipment is provided for the program.

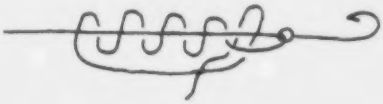
Trailmaster spin/fly rod in case.
Spinning reel.
Snap swivels.
Plastic bubbles.

Mountain:
- Daredevils
- fly reel with tapered floating line
- tippet spool
- mucilin
- flies:
  - muddler minnow
  - gray hackle red
  - royal wulff
  - blonde wulff
  - adams
  - kolzer yellow
  - woolly worm

Water:
- steel leaders
- float
- slip shot
- lures:
  - rappala
  - daredevils, large and small
  - mepps #2, & #3
  - jiggs
- spare hooks

Instructors carry a few extra lures and flies for replacement purposes.

The only satisfactory knot for tying fishing line is the improved clinch knot, illustrated here.



GEOLOGY INSTRUCTION

by Phil Shore

As in most aspects of the Wilderness Program, instruction in geology must be superficial at best. It can form a base from which a student may wish to engage in regular study of geology once back at Earlham, as well as demonstrating how a knowledge of geology can enrich the experience of traveling through an area.

Geologic instruction in the program has two main components, 1st, to point out to the students the more distinctive geologic features of the areas they are in, and 2nd, to give them some idea of the

geologic history of the areas so they may get an idea of the forces and processes which have gone into forming what we see today. Instruction should be in clear, non-technical terminology.

GEOLOGIC HISTORY OF WESTERN ONTARIO

The canoe country of Canada is in what is called the Canadian shield. A geologic shield area is a large block of the earth's crust which has been relatively stable for a long time, with only gentle warping having taken place. The Canadian shield covers about two million square miles. Its boundries are roughly the St. Lawrence valley, the Great Lakes, and northwest along the line of large lakes - Lake of the Woods, Winnipeg, Athabasca, Great Slave, and Great Bear. This was the area which gave the term "shield" to such geologic features. It was formed to resemble an old military shield, i.e. hard, slightly convex and with a point at one edge.

Sometime after the earth was formed (about 4.5 billion years ago) a crust started forming. A slight depression formed at one place, and, since the general forces at work then were the same as those at work now, material eroded and collected in the low place. This illustrates one of the general principles you should learn. The geologists' word for it is uniformitarianism. It simply means that the forces at work millions of years ago, and the results of those forces, are assumed to be the same as what we can observe happening today. Don't look for some extraordinary explanation for some observed feature unless all else fails.

But to return to the low place on the crust of the earth. Just as on a tarp that has a slight sag, when it rains, a little water will collect. So with the low spot on the crust. As it sank lower (dragged downward by internal forces not well understood) more erosional materials collected and so on for millions of years. This collection eventually reached a thickness of several tens of thousands of feet.

Such a depth of eroded materials has two effects. One, the weight of so much on top plus higher temperature and pressure at depth in the earth caused the stuff at the bottom to (here is another technical term) metamorphose. This term is from the Greek and literally means a change of form. The rocks changed their form. Some parts of the rocks partially or wholly melted and then when they solidified again, they weren't quite the same (there was a change in crystal structure) as they had been before.

The second result of this enormous pile of eroded stuff was that such an oversized wrinkle in the surface of the earth was unstable. There was some general movement in the crust to accomodate the wrinkle, and this caused some gentle folding of the newly metamorphosed rocks. This folding caused some of the rock to rise, which formed mountains. When rocks fold, they are likely to crack and these did. These cracks reached to a molten area below the solid

rocks. The molten rock, which of course was under great pressure since it was so deep in the earth, moved up through the cracks. For obvious reasons, this new material is called an intrusion. At some places it reached the surface and erupted out of volcanoes.

All of this had the effect of increasing the instability of the region because it was just adding more to the already big pile. The volcanoes were spreading lava and ash around and the other mountains were eroding and adding eroded materials to the nearby low areas. Eventually the crust reached some 50,000 feet of thickness. Just as with an iceberg in the ocean, most of this was below the surface of the earth. The increased instability and continued subsidence and squeezing of the pile caused much more severe folding and another range of mountains was formed.

At this point we need to introduce a second principle of geology called isostasy, also from the Greek, meaning standing still, or equilibrium. This means that the higher the mountain goes, the deeper the roots of the same mountain must go to maintain equilibrium. We see the same thing everyday in the canoes. They float very high until we dump a Duluth pack in. Then they sink a little lower in the water, a second Duluth pack and they sink lower. If we carry this far enough we will sink not only the canoe but the analogy, but you get the point. Conversely, if you take a Duluth pack out of the canoe, it doesn't stay where it was; it rises in the water.

The same thing happened to these mountains that were formed. As this big pile of materials readjusted itself, it pushed mountains up and at the same time pushed the roots of these mountains down. These roots reached about 10 miles below the surface, which probably indicates (uniformitarianism) very high mountains. At that depth the weight of the overlying rocks, plus the heat (remember the center of the earth is molten) caused very severe (technically high grade) metamorphism. Part of the rocks really melted instead of just getting sort of soft. We know this because the biotite in the rocks (the little black crystals we see in so much of the granite) recrystalized.

By using rubidium-strontium radioactive dating techniques on the biotite, we know that this recrystalization took place about 2.2 billion years ago. We know from various other evidence that many of the rocks are older but present dating techniques don't allow us to date them. So, in about 300 million years we had a basin or trough develop, accumulate sediments become unstable, and form small mountains, erode these at least partially and form more and bigger mountains. For most of the rest of time we don't know what happened to this area because there are no rocks of these ages to record geological events. We do know that it hasn't been very exciting or there would be a record of it. Over these past 2.2 billion years the mountains have been eroded to what we see today. Here is where the other half (the unloading of the canoe) of isostasy comes in. As the tops of the mountains were worn away, the bottoms gradually rose (i.e. the mountain block "floated" higher) so that what we see around us are actually the roots of the mountains. This is how we can figure out so much of what happened

so long ago. What used to be deep in the interior of the mountain range is now at the surface. So on the principle that rocks behaved the same 2 billion years ago as they do now (uniformitarianism again) we have figured out what had to have happened to give us the rocks we see today.

The schists (most of the black rocks we have been seeing) are the metamophosed products of the original sediments. The gneiss (the moderately coarse grained rock, usually with thin black streaks) is the first intrusions. Both of these were metamorphosed at the time of the second mountain building period. In addition, we see a lot of white rock with lots of black speckles - the granite. This was intruded after the time of most severe metamorphism, but presumably during the disturbance caused by the building of the second range of mountains.

The next time we can be fairly definite about what happened is during the period of the great ice ages. This is just the last million (not billion) years. At least four times during this period, great continental ice sheets have spread out from central and northern Canada. Each time the advancing ice would scrape any vegetation and much of the soil off the landscape and carry it along as the ice moved slowly southward. Each time the ice melted back the process of forming a new soil from the rocks could begin again.

The net result of this is that there is lots of deep rich soil in the United States now, where it was left by the glaciers, but there is very little in many areas of the Canadian shield, which includes where we are. The landscape we see today is the result of this repeated scraping by glaciers. The last one melted back about 10-20,000 years ago. Essentially all of the soil we see, and every time we try to dig a sump hole or kybo we realize just how little bit there is, has formed in these 10,000 years. (The average depth is 10", or 1" formed each 1,000 years.) The ice scraped out the basins where the lakes are and left the hills. In many areas we see large bolders which are clearly different kinds of rock from what they are resting on. These are glacial erratics that were frozen in the ice and carried along. When the ice melted the rock just dropped down to where it is now. Glacial striations, grooves in the bedrock made by other rocks frozen in the bottom of glaciers as it slowly slid along, are fairly common. Occasionally glacial polish is seen. This is where the bedrock has been smoothed to a high polish by the movement of the ice.

The glaciers also offer us another, and different, example of isostasy. The weight of the ice was so great that the surface of the earth was depressed, hundreds of feet in places. Since the ice melted the surface has been rising again. Mountains erode so slowly that the roots rise at about the same speed as the tops erode, but ice melts faster than the earth's crust can respond, therefore, the crust is still rebounding after the melting of the last glaciers. Chicago is rising a little, but the north end of Lake Michigan is rising even faster. Hudson's Bay is rising faster still. In a few thousand years Hudson's Bay will be just a small inlet from the ocean.

One exercise which may be used when the proper rocks are found is to show students a rock which is cut by dykes and veins. These may be accompanied by some evidence of movement along faults. Ask the students to figure out the relative ages of the different parts of the rock and to indicate which way movement took place, if it did. Such an exercise in geologic detective work is fun and teaches the basic principles of dating structure in the rocks. Perhaps most important, it is a demonstration of how much we can learn from a rock by really looking at it carefully and critically.

It may be useful to give the basic geology "lecture" during the day sometime when the students can look at the landscape, and then at the end have them just sit and consider some of the following: The rocks they are sitting on are the oldest in North America and among the oldest things on earth. Try and conceive of what a billion years is. Look at the landscape and imagine ice a mile thick on it. Try and imagine pressure and heat so great that rock will flow like tar. All of these can be used to convey some impression of the immensity and magnitude of the processes just talked about, and the enormity of geologic time.

THE GEOLOGY OF THE UINTA MOUNTAINS

by Charles Martin

The Uinta Mountains were one of the first of the western mountain ranges to be intensely studied by geologists. It happened to be an area where three of the surveys of the 1860's and 70's (Powell, King, and Hayden) overlapped, and in their efforts to outdo each other, competition in the Uintas was intense. Partly because of this, and partly because the geology is relatively straightforward, more has been known for a longer time about the geology of the Uintas than about most other western mountains. The importance of this range in the development of American geology is indicated by the fact that several major peaks are named for early geologists and topographers, (including King, Powell, Hayden, Wilson, Emmons, Gilbert, and Agassiz.) The latter, incidentally, was the mentor of Joseph Moore, Earlham geology teacher until 1900, and President of the College from 1868 to 1883.

In discussing and teaching geology, it is important to distinguish between that which can be observed, and that which is interpretation. In the Uintas three types of geological phenomena can be observed: 1) the rock, which happens to be all about the same; 2) structures, mainly folds and faults imposed upon the rock by stresses during mountain building episodes; and 3) the topography which is evident once you are there.

From observation of these features it is possible to make some interpretations about the geological evolution and history of the area. Geologists are aided in making these interpretations by the Uniformitarian Principle which assumes that geological processes now operating have always operated in the past. This means that

"rocks that formed long ago may be understood and explained in accordance with physical processes now operating."

As instructors you should always be alert for examples to illustrate this - streams transporting sand, sediment being deposited in lakes, mud cracks, ripple marks, raindrop imprints, etc. might be used to explain how similar features observable in the rocks were formed. In general, get the students to begin observing rocks, structures, and topography as soon as you get into the area. As more data are accumulated, guide the students into valid interpretations based on the Uniformitarian Principle. Obviously, you will need to do a good deal of prodding, and supply missing information. This summary of the geology of the Uintas follows this pattern, by first describing the rocks, structures and topography that can be observed, and concluding with the interpretation of geologic history.

Rock Types

All of the rock that you will see while backpacking in the High Uintas belongs to the Uinta Mountain Group which consists mostly of medium-grained, red or gray quartzite, but contains some thin pebble layers and thicker shale beds. The shale which has a greenish tint is expecially prominent near the summits of the peaks and along trails over some of the higher passes, especially in the western part of the range where it is more abundant and thicker. It can be seen on the flanks of Wilson Peak, and along the trail over Anderson Pass and Dead Horse Pass.

Other features that can be seen in the rocks of the Uinta Mountain Group include cross-bedding, raindrop imprints, and mud cracks, all suggestive of shallow water near shore, depositional environment for the sediment, perhaps tidal pools and dessicating mudflats. The pebble layers require greater transporting energy than sand, and are likely to have been stream deposited in alluvial fans near the shoreline. The abundance of deeper water sediments (shale) to the west, and of pebbles to the east indicate that the source area for the sediments was a land area to the east, with a shoreline fluctuating through what is now the High Uintas. The total thickness of the Uinta Mountain Group of rocks is about 24,000 feet, thus the depositional basin must have been subsiding as the sediments accumulated. The Uinta Mountain Group rests on top of rocks that have been dated by radioactive decay rates to be 2.3 billion years old, and it is estimated that the Uinta Mountain Group is about 1 billion years old.

Rocks that were originally deposited above the Uinta Mountain Group have been removed by erosion except on the flanks of the range. These younger rocks are well displayed in Sheep Creek Canyon, Flaming Gorge, along route 44 north of Vernal (where they are identified by signs along the road), and in Dinosaur National Monument. Full descriptions of these rocks can be found in U. S. Geological Survey Bulletin 1291, The Geologic Story of the Uinta Mountains.

Structures

The rocks which form the Uinta Mountains were deposited at or slightly below sea level; today they are at elevations up to nearly 14,000 feet above sea level. Since there is no way to account for a drop in sea level of that magnitude, the rocks must have been uplifted by at least 14,000 feet. The processes of mountain building obviously involve forces of stupendous magnitude (you might ask the students to imagine the forces necessary to life a 150 mile long segment of the earth's crust some 14,000 feet) and they leave their imprint .1 the form of geologic structures.

The major structural feature of the Uintas is a broad E-W trending upfold or anticline 150-160 miles long and 30-35 miles wide. The Uintas are the only major E-W trending mountain range in the United States. The west end is truncated by the Wasatch Range near Salt Lake City; the eastern end of the fold plunges to the southeast beneath younger overlying sedimentary rocks (we cross it on the highway between Skull Creek and Maybelle, Colorado) and eventually merges with the Park and Sawatch Ranges in Colorado. The crest of the anticline coincides closely with the crest of the High Uintas, and the flanks of the fold with the north and south boundary of the mountains.

Obviously the fold has been eroded to reveal the visible layers of rock. Because the fold is so broad, the rock layers in the whole crestal region are nearly flat-lying, becoming progressively more steeply inclined away from the crest towards both the north and south flanks. The fold is assymetric with the dip (inclination) greater on the north limb (flank), thus the distances from the flatlands to the crest of the range are less on the north side than on the south. Those hiking in from China Meadow appreciate this; those coming from Moon Lake will know better next time. The nature of this broad anticline can best be seen from the summit of any of the major peaks (King, Powell, Lovinia, Wilson) from which can be seen the horizontal rocks on the crest flanked by more steeply dipping rocks to the north and south.

The second type of structure abundant in the Uintas is the fault, a surface or zone of breakage along which rocks on one side have moved relative to those on the other side. Three major fault zones, all trending E-W occur in the Uintas: the North Flank fault and the South Flank fault along the respective sides of the range are not obvious in the places our expeditions travel; the Crest Fault, a short distance north of the main ridge of the Uintas, is visible in several places, most notably on the ridge west of the head of head of Blacks Fork, northwest of Red Knob and Dead Horse Passes. Smaller, unnamed faults are visible cutting the ridge east of Oweep basin, on Mt. Wilson at the head of Oweep basin, on the west side of Mt. Powell, and elsewhere. Most faults in the Uintas are rather broad zones of crushed and shattered rock, thus they weather and erode readily and are often marked by gullies or troughs of loose talus blocks. They are best recognized by rock layers that do not match on opposite sides of the fault. The displacement (offset) on the Crest Fault is estimated at 2,000 feet with the north side dropping down.

Cracks in rocks along which there has been no displacement are called joints. These are ubiquitous in the Uintas and are important as access ways for water that upon freezing breaks the quartzite and thus aids in gravity movements and erosion.

Topography

That the Uinta anticline has been eroded to produce the present landscape is evident; it is the nature of these landforms that allows interpretations to be made of the types of erosive agents and processes operative. Valleys in the Uintas are very broad and flat-bottomed with steep slopes or cliffs along the sides and head. They can be described as having a U-shaped cross-section. Ridges along the crest of the range are typically narrow and sharp, whereas many of the divides between canyons on the north and south sides of the crest have broad, flat summits.

This kind of topography is characteristic of erosion by glaciers. Snow accumulated at the heads of valleys, compacted under its own weight to ice, and driven by gravity, flowed slowly down the valley abrading the rocks of the walls and floor. Evidence of this abrasion is abundant as striated (scratched) and ice polished surfaces on quartzite outcrops (I have seen excellent examples in the upper Lake Fork drainage and along the trail between Ledge Lake and Dead Horse Pass, but many other examples are sure to be present). When the ice melted it left broad valleys with amphitheater-like heads (cirques), narrow ridges (aretes), and, where several glaciers carved into a mountain leaving it semi-isolated, a horn. Ice-scoured depressions in the valleys filled with water to form lakes. Locally, particularly in the lower reaches of valleys, the melting ice dropped debris it was transporting producing hummocky areas called moraines.

There is evidence that three episodes of glaciation affected the Uintas. During earlier glaciation, the south flank glaciers were larger than those on the north, probably because the asymmetry of the anticlinal uplift provided a larger snow accumulation area on the broader south side of the range. Thus the valleys on the south flank are larger. The last glaciers were smaller than their predecessors, and, although they had minor effect on the broad valleys to the south, they deepened the north facing slopes and produced the present rugged topography on the north side of the range. The last period of major glaciation ended about 6,500 years age; since then small glaciers have occupied some of the cirques, but no glaciers are present in the range today.

A major component of the present landscape of the Uintas is the abundant loose rock that mantles much of the surface at higher elevations. These rocks are the products of frost action on the brittle, jointed quartzite. Where this debris has not been transported, it is called felsemeer. Where broken rocks fall or roll downslope under the influence of gravity, they accumulate in sheet or cone shaped deposits called talus. Talus is abundant at the foot of nearly every cliff in the High Uintas. In a few places, notably the east side of Red Castle, these accumulations of rocks contain sufficient ice between the boulders to allow movement of

the whole mass. These are rock glaciers which typically have a lobate form, and produce rock flour (finely ground rock material), which remains suspended in lakes giving them a milky appearance.

Geologic History

From observations of the rocks, structures, and topography some conclusions may be reached about the geologic evolution of the High Uintas. We have already cited the evidence that indicates that about 1 billion year-old sand, pebbles, and silt (shale) were deposited in a near shore environment to produce the sediment that became the rocks of the Uinta Mountain Group. This deposition came to a close about 600 million years ago, probably because of a broad, gentle uplift of the area.

There is no direct evidence of events in the High Uintas for about the next 525 million years, because erosion has removed all of the rock record. However, on both the north and south flanks of the Uintas a thick sequence of sedimentary rock formations records numerous advances and recessions of a generally shallow sea. These rocks can be seen at Flaming Gorge, along route 44 north of Vernal, and at Dinosaur National Monument. In a general way, they show that during the first part of this interval a clear sea occupied the site of the Uinta Mountains but that it gave way later to a low, continental plain, sometimes arid, sometimes inundated, that in the later stages was the home of the great dinosaurs.

About 75 million years ago the last rock formation that was uplifted in the Uinta anticline was deposited. This dates the mountain building episode that formed the Uintas at about 70 million years ago, during the late Cretaceous period. This uplift was a part of a much larger area of deformation which affected most of the western mountains from the Sierras to the Front Range of the Rocky Mountains.

The history of the Uintas for the last 65 million years is dominantly one of erosion. All of the younger sedimentary rocks now preserved only on the flanks of the range but which originally covered the range and were uplifted with it were eroded from the crest down to the Precambrian Uinta Mountain Group. Undeformed sediments in the basins on both sides of the range show the existence of fresh water lakes into which were deposited sediments shed by the range. These lake sediments are noteworthy because they contain excellent fossil fish remains, and also extensive oil shale deposits. Continued uplift of the range may have occurred, and stream drainage systems were developed in the Uintas. At the time the Ice Age began, about 1 million years age, the Uintas consisted of quartzite mountains cut by stream drainage systems. These stream valleys became the sites of glaciers which sculptured the range essentially to its present form. Post-glacial modification of the High Uintas consists mainly of frost action and stream erosion.

SOIL FORMATION AND PLANT SUCCESSION

by Douglas Steeples

Both the canoe and mountain program are in areas which were heavily glaciated. Glaciation determined the appearance of the landscape today, and also the nature, depth, and extent of soil and vegetable cover over bedrock. Students should be introduced to the relationship between bedrock, climate, soil, vegetation, and plant succession, to enable them to interpret the environments through which they pass.

In general, the soils which our students observe will have developed after the most recent epoch of glaciation, say within the last ten to fifteen thousand years. The means of their development, their nature, and that of the life communities that they support, are all intimately connected.

There are two principal soil regions within the United States. The first lies in the East, a region of humid climate, and, in the North at least, a temperate or cool climate. These eastern soils are called Pedalfers, meaning that they are rich in aluminum and iron, for which the chemical symbols are Al and Fe. Pedalfers have a characteristic profile when viewed from bedrock to surface. This profile is usually treated in terms of three horizons.

The lowest horizon is called the C horizon and consists of unaffected parent rock, which has been unbroken by water, weather, or other processes.

Lying immediately above the C horizon is the B horizon, which is also known as the zone of illuviation. In this zone, the parent rock has largely been broken down through the processes of weathering, percolation of water which reacts chemically with minerals in the rock to break it down, and of acids and other chemical compounds generated through decay of plant life. In this zone, too, plant nutrients accumulate. These nutrients are said to be adsorbed, that is, held in solution in ground water which adheres in an extremely thin molecular layer on the surface of individual particles or grains of soil.

At the surface is the A horizon, the humus zone, consisting partly of tiny fragments of weathered and broken down remains of the original country rock, and containing a large quantity of organic material deposited through the decay of plant and animal life. This zone contains insoluble minerals (the soluble minerals are leached by percolating water to the B horizon) and this zone is known as that of elluviation, that is, the zone from which water percolates.

The characteristic soils of the arid regions of the West comprise the second great soil region of the United States. They are called pedocals, meaning that they are rich in calcium. They exhibit a profile that is typically different from that of pedalfers. The mountain program occurs at high elevations in a region of cool

climate and moderately heavy precipitation. It is a sort of soil island amid pedocal soils, more characteristic of the humid, cool portions of the East. Thus both the water and mountain programs occur in regions of pedalfers. In fact, the water program will be in a region where a specific type of pedalfer soil is found. Known as podzols, these are acid soils, formed in a cool climate with moderate precipitation where ground cover consists for the most part of coniferous forests. These forests deposit a relatively slight amount of plant debris each year and precipitation leaches most of the plant food out. These are not notably fertile soils.

As the glaciers receded, they left behind bare country rock, or morainal deposits, great piles of rock and other debris that they quarried and transported to their feet. This was the parent material from which soils developed. The development of the soils depends on several factors. Among these are the operation of the climate, with its pattern of freezing, thawing, raining, snowing, heating, cooling. Each of these factors has an effect on the rock, expanding and contracting it, allowing water to penetrate tiny cracks and freeze, thereby widening the cracks. This process operates over time to shatter the country rock. Water also reacts chemically with minerals composing the rock to break them down.

Where this rock exists above the surface of water, certain other characteristic patterns come into play. As the particles are sufficiently broken down, and sufficient nutrients are exposed, lichens begin to grow as the first plant community. Lichen is an association of algae with a fungus. It contributes to the breakdown of parent rock, releasing as it decays, acids which attack the rock. With the slow breakdown of country rock, decay of lichen, and deposit of organic wastes, moss is able to secure a hold. The mosses come to cover wider areas, and their cycle, ending with decay, adds to the quantity of organic wastes, and the availability of acids which can further break down the parent rock. The roots of the mosses, moreover, penetrate into cracks, further breaking the rock up. In time, herbs and grasses begin to grow, and contribute further to the process of soil composition through their own decay, root pressure, and so on.

The next episode in the history of plant succession and soil creation occurs when shrubs begin to flourish, and trees appear. The final stage involves the development of the climax community, or a plant association best suited to a particular environment. The local soil, and the local plants have matured when the climax community develops. Left undistrubed, under constant conditions of climate, this community persists indefinitely.

There are of course, considerable variations between climax communities in different environments. In the Uintas, for example, the climax community typical of the lower flanks of the range is essentially a sagebush association. Stream banks exhibit willows, cottonwoods, alders. At somewhat higher elevations, the dominant community flourishes around a basis of lodgepole pine. Even higher lies the zone of Engelmann spruce and alpine fir, while highest of all are the alpine meadows.

Where the process of soil formation occurs in or around lakes or ponds, it is influenced by the movement of water. Running water has the tendency to carry rock particles to the point at which streams enter ponds or lakes, building up deltas which intrude into and finally fill an entire lake. Deltas consist not only of rock and mineral matter, but also of organic matter carried off by slumpage as a stream undercuts its banks, or as surface runoff brings such matter into the flowing water of the stream. In any event, the deltoid deposits, and other lake edges exhibit a characteristic succession of vegetation.

The first vegetation of consequence to appear around the edges of ponds or lakes is pond lilies. As these flourish and die, they deposit a body of decaying organic matter which in time creates sufficiently fertile soil to sustain a population of rushes. Rushes in turn yield to sedges and grasses, as the deposition of organic matter results in a firmer and drier soil. The sedges and grass stage characterizes the appearance of a meadow, which may embrace an entire lake or pond, or only the portions around the edges, filled in with advancing soil. Following the sedges and grasses are herbs, which in turn yield to willows. Finally, where conditions are suitable, a climax forest community ventures into the now filled lake. For some meadows thus created, the cycle has not yet ended. The continued operation or drainage of the stream through the meadow, can create a deep enough gash to lower the water table substantially and produce another round of activity.

In the case of both terrestrial and stream or pond environments, it is possible to observe from single positions an entire succession in the process of soil formation and plant succession. A single pond may exhibit from the shallower water near the edges outward to its former banks flourishing concentric communities of lilies, rushes, sedges and grasses, and, where sufficiently dry soil has been created, herbs, willows, and finally the climax community. The same might be said for the terrestrial succession from the first appearance of lichen on bedrock to the advent of a mature soil with a climax plant association.

LAKES AND LAKE CYCLES

by Douglas Steeples

The lakes and other bodies of still water observed on wilderness expeditions all display a peculiar ecological significance and teaching usefulness. As early as 1887, S. A. Forbes, in "The Lake as a Microcosm," identified the lake as a biological system, one of the first to be designated and described in detail. Observations in the field can show students how lakes illustrate principles at work in all ecosystems. One of the foremost of these principles is that the forces within an ecosystem at a given time work to change conditions around and within a lake, in turn allowing new processes to occur.

Lakes pass through a predictable cycle. They originate variously - through geological folding, faulting, glacial scouring, the oxbowing action of streams, and other processes which create depressions on the earth's surface that in time fill with water. New lakes are typically clear, deep, cold, and high in oxygen content. Their waters are cold mainly because infrared rays, heat-bearing portion of the spectrum, do not penetrate deeply into water. Oxygen content is relatively high because cold water can contain more dissolved oxygen than warmer water, as anyone who has observed the bubbling action of boiling water can recall. They are clear because the water contains relatively little life or other matter such as phosphorous, nitrogen, and calcium, all of which are essential to life. Such lakes are called oligotropic (literally, low in food). The life forms inhabiting them typically tolerate or require cold water and a high oxygen content. The characteristic forms in high western lakes and streams are the trout, which must subsist in waters relatively low in phytoplankton (algae) and zooplankton (tiny animals), the minute organisms that are at the bottom of the food chain.

Montane oligotropic lakes are quite fragile; they are closed systems with only a few food chains at the top of which are trout with their specific and narrow requirements for survival. Even minute quantities of pesticides, such as DDT, eliminate or contaminate organisms lower in the food chain. This can in time eliminate the trout as well, for pesticides accumulate in greater concentrations up the food chain. Organic material, such as soap, the breakdown of which takes oxygen and thus reduces the supply of dissolved oxygen available for aquatic life, can have a similar effect.

These observations also apply to streams in the high mountains, and to a considerable extent to the lakes and other waters of the Canadian shield, which supply fish species requiring somewhat less oxygen and somewhat higher temperatures than trout. These species include pike, muskellunge, pickerel, occasionally in warmer water bass, perch, and others.

Unless the climate is very cold or adjacent geological formations are quite deficient in minerals that serve as nutrients, the level of biological activity gradually increases. Organic matter such as phytoplankton, zooplankton, and organic debris accumulate in the warmer surface waters. The clarity of the water decreases, at first gradually and then more rapidly. Light can penetrate less and less deeply into the water and photosynthetic activity is concentrated close to the surface. Debris, decaying organic matter, and silt carried into the lake by the stream feeding it all work to make it shallower as it becomes richer in life. It becomes warmer as its depth decreases, and displays a more complex set of food chains. Such a lake is called mesotrophic (moderately rich in life).

Sedimentation rates vary. Low sedimentation rates and quite cold climates may keep some lakes oligotrophic indefinitely. Or a cold climate and low nutrients may hold a lake in an oligotrophic condition until it is entirely filled by silt carried in by the stream that feeds it. The same may be generally true of mesotrophic lakes, some of which never change.

But if sedimentation is active and the level of biological activity is high, because of climate, the availability of nutrients, and the like, a lake will next become eutrophic (rich in life). Such a lake is typically quite shallow (often only ten to thirty feet in depth) and its waters are very turbid because of a high level of biological activity. Because it is shallower, its waters are warmer, supporting such warm water fish species as sunfish, perch, small mouth bass, and bullheads. As it continues to fill with debris and silt, becoming even more shallow, it supports only bullheads and perch at the top of the food chains. Shallow bays fill in, becoming swamp-like. On balance the lake is extremely rich in nutrients and life containing many and complex food chains. Because its prolific life uses a great deal of oxygen, and because its waters are warm, its dissolved oxygen content is much lower than that of oligotrophic or mesotrophic lakes. At the same time it is more stable than a lake less rich in life, because it contains a complex net of food chains.

If the process continues to its end, a lake becomes dystrophic (literally, dead). Semi aquatic and terrestrial plants invade. Decomposition of this organic matter uses oxygen faster than it is produced, and the lake chokes. After the tempo of life slows among aquatic organisms, they finally die. Turbidity is so great, where water remains, that light can penetrate at most three feet. The lake becomes a marsh, then a meadow.

But the process may then resume, especially in the mountains where relatively steep gradients allow streams to downcut through meadows and create new depressions that may fill with water. Or landslides may block routes quarried out by streams, renewing lakes or creating them where none had existed before. Or glaciations near the peaks quarry out high depressions that fill with water, known as tarns. What we observe, then, in both the mountain and northwoods environments are lakes displaying most of the stages of the lake cycle and illustrating for us the ways in which the cycle progresses and lakes operate as closed, complex, and continually changing systems. From a careful observation of lakes and informative discussion of the lake cycle and life processes, students may come to appreciate more fully the complexity of earth, and the uses to which wild envirnoments may be put as sites for field observations of unimpeded natural processes.

THE NORTH WOODS

by Phil Shore

The flora of the southern Canadian shield forms a very complex community. We can expect to do little more than have students learn to use a botanical key, learn the major trees, and point out some of the complex inter-relationships among the plants and their relation to soil types, moisture, etc.

This is the boreal forest of North America, sometimes called the Taiga (from the Russian) or simply the north woods. The distinctive character of such a forest is the dominance of conifers. Here we have pines (red, white, and jack), spruces (white and black), fir, and northern white cedar. These form the bulk of the older forests. Mixed in are some deciduous trees. Most common are aspen, white (or paper) birch, maple, and alder. There are also many shrubs and smaller plants, but they are mostly difficult to identify except when in flower. If the students learn the above trees and something of the ecology of the forest, it is all we can hope for. Harlow's Trees can be used to teach the distinguishing features of each tree species.

Thus far it is relatively simple. But we should expect the students to notice that the trees are not mixed among each other randomly. In places we find areas of almost nothing but spruce, and other places scattered red and white pine with smaller birch, maple, and aspen underneath. White cedar is not found in marshes but is in swamps and is often noticeable around lakes. What causes the variation?

Perhaps the examples of succession most easily found are those of marsh to meadow to alder thicket and finally to forest. Almost every brigade will encounter examples of each. At some appropriate time the instructors should call attention to examples that have been seen and how they relate to the plant succession, with each stage being determined by what preceded it and in turn determining what follows. After such an initial discussion, students should be encouraged to note other areas which are seen and to place them in the proper sequence.

Briefly, the succession which will take place naturally is as follows. After a lake has turned to marsh (see lakes and lake cycles) the portion of dry ground will gradually increase due to the build-up of decaying plants, and the water will be confined to a few channels. Dense grass, up to 4 feet high, will take the place of marsh plants. This forms excellent browse for some animals. Because the grass is so dense, few trees can take root.

The first to appear is alder, first in a few scattered clumps but gradually covering more and more of the meadow until it becomes so thick that the grass is stunted or even excluded almost completely by the shade created. At this stage the shade-tolerant trees can get a start. These are the spruce, fir, and cedar. As they begin to dominate the relatively low alder, they will exclude so much

light that the alder will die out from under them. The next stage may be relatively short or may last for many decades. The spruce and fir and cedar are the only trees which can sprout and grow in the dense shade produced by a mature spruce forest. So other varieties will not intrude until some outside agent disrupts things. This can be wind, fire, insects, snow, man, or old age.

Whatever the agent, let us assume first that only one or a few trees are removed - by death perhaps, or by being broken by heavey snow or being blown down. This creates a "forest window," allowing sun and rain to reach the forest floor. Now there is a chance for pines, aspen, and birch to grow. Which ones will appear depends partly on seed sources in the area. If they are given a chance, the red and white pines will produce the largest trees in the area, but they customarily are not so dense that others are excluded. The presence of aspen and birch quickly builds up a humus layer on the ground from fallen leaves and twigs. This is a particularly good seed bed for spruce, so the round gradually starts again. From all said thus far, it would appear the spruce would eventually dominate to the virtual exclusion of all else. Until European man appeared something like 100-150 years ago and started massive lumbering operations, there was only one major influence we have not considered. Fire.

There is evidence that at least 95% of the area has been burned repeatedly for hundreds of years. Fire can kill the forest, enrich the soil with nutrients usually locked in living plants, change the depth of the duff-humus layer, soil moisture content and temperature. All of these factors influence the kind of forest that returns. Some trees may survive a fire, especially the red and white pines which have thick insulating bark to protect the cambium layer from the heat. Birch, aspen, and spruce have thin bark, and in any fire, even a low ground fire, the cambium layer is cooked and the tree killed. However, the birch and aspen have developed a defense as a species. The aspen roots and the birch stumps are usually not killed, and they put forth new sprouts so that within months of a fire where there were aspen or birch previously, there will be a dense growth of young trees from the old roots or stumps, to the virtual exclusion of almost all else.

The jack pine has a thin bark, and is easily killed by fire, but it has developed a cone that needs great heat to open and release the seeds. A light fire can open many cones and result in a dense stand of jack pine in some cases. In other cases after a fire, woody shrubs of various types become established before sun loving trees (birch, aspen, maple) and serve to exclude most other growth until the shade-tolerant species can become established. In this case recovery of the forest can be very slow.

Wind or insect infestation can have some of the same effects as a fire, but rarely as extensive. Commonly, there are a variety of forces affecting the plant succession at any one time. These all have effects also on the animal and bird life. Woodpeckers thrive in an area after a major fire, as they feed on insects in the still standing dead trees. An infestation of spruce budworm will bring

large numbers of warblers who feed on the budworm larva. The permutations and combinations in a web of life as complex as this are, while not infinite, so numerous that they are not fully understood. On a pre-term expedition we cannot hope to do more than indicate some of the most obvious ones, and to indicate what factors are involved, and therefore why the whole is so complex. This section is necessarily over-simplified. Instructors should read other materials before leaving on expedition and thoroughly familiarize themselves with more of the major varieties of plant succession.

WILDLIFE IN ONTARIO

by Phil Shore

Participants are unlikely to see much animal life in Ontario except for birds and mosquitoes. However, they will have many chances to observe signs of the presence of animals. While we may deplore not being able to see the animals themselves, we can take advantage of the situation to increase the students' keeness of observation and ability to arrive at logical inferences from the observations.

The large animals present in the Dryden area include moose, white tail deer, black bear, beaver, and gray or timber wolf. Porcupine, raccoon, woodchuck, mink, red fox, and skunk are also present, but are almost never seen and signs of their presence are far from obvious. Squirrels, chipmunks, and otters are seen and heard from time to time.

Perhaps the most obvious evidence of animal life are beaver dams and lodges. Canoers soon learn that the presence or absence of a beaver dam may spell the difference between a pleasant paddle and a hard slog through marsh or portage. This encourages respect and care when crossing dams. Lift the canoe over, and do as little damage to the dam as possible. Beaver may be seen, or at least heard, about dusk when the group is camped near a dam. They are easily frightened and so quiet is necessary for good sightings. Almost certainly students will see downed aspen and birch trees that the beaver have cut for food. They eat the bark and small twigs, and store branches underwater for use during the winter. It is also likely that the rather narrow paths from a marshy pond leading through the grass will be noticed. These are some 8-10 inches wide and a few inches below the water line so the beaver can stay underwater as long as possible before venturing onto dry land. They much prefer the water as they feel safer there. These paths lead toward food supplies in the form of groves of aspen or birch. It is not known just how they originate, but they are kept open by the passage of the beavers. Constant passage may actually wear them down and so form or enlarge them.

The other most obvious sign of animal life is the browse line on trees. This is especially notable on white cedar around a lake shore. No formal garden was ever trimmed to a more precise height.

This is evidence of moose and deer. They stand on the frozen lake surface in the winter and eat everything within reach, which is the reason for the level pruning job. White cedar appears to be a preferred winter food, though the particular affinity of white cedar for lake margins and the obvious browse line may simply mean that this is what is most observable to someone in a canoe.

When portaging (or more likely busting) through meadows and especially meadows mixed with alder thickets, moose trails and even bedding places may be encountered. It is also likely that scat (droppings) will be seen. These are rather large (3/4 - 1 1/2 inches) pellets. Actually seeing a moose is unlikely, but possible. We have averaged about one sighting per year. Since males weigh up to 1100 lbs. and can run up to 35mph and can swim as fast as two men can paddle a canoe, it is best to observe them from a distance. They have very poor eyesight but good hearing.

Black bears are in the area. Scat is occasionally seen, and sharp eyes may detect claw marks on the trees when they mark their territory. They have poor eyesight but a good nose. Since they can weigh up to 500 lbs. and can climb trees fairly well as well as run (up to 30 mph) and swim some, it is just as well that they are quite frightened of humans until familiarity breeds contempt. In the first three years of the wilderness program only one bear was sighted. Bears are omnivors, like man, and quickly develop a taste for camp food. This is a particularly strong reason to burn and/or bury all leftover food. A hungry bear rampaging through food supplies is not a pleasant prospect, so don't attract them by leaving good smelling food lying about.

Wolves are in the area - one beautiful large paw print has been seen by one of our expeditions - but none have been sighted. With real luck you might hear them howling some night or see another track, but more than that is unlikely.

Otters are occasionally seen as they swim in shallow portions of a lake, especially near reedy or marshy areas. They eat fish, frogs and other aquatic life. What is seen is a small snout out of the water with a rather long (2 - 2 1/2') animal with a tail about another foot long trailing after it. They are quite slender. They are very quick and disappear under water or into the grass as soon as they detect your presence.

You may hear a blood-curdling scream in the woods. If you have established that it isn't one of the students, feel confident that it is a porcupine. Their scream sounds rather like a large cat to most people. Students who hear this on solo find it particularly unnerving.

You will hardly be able to miss the red squirrel. He is a very noisy little fellow who sits about 10 - 20 feet up in a tree and makes a ratchet-like noise. It may easily be confused with a bird call, especially early in the morning when he enjoys waking the world up. Chipmunks are frequently, though briefly, seen as they

scurry around near campsites. They may be cute but have been known to gnaw into packs, stuff bags and such, so encourage their presence at your own risk.

As almost all signs of the animals are easily missed, the students should have them pointed out at first and then be encouraged to be alert for other signs. They cannot be expected to recognize them all, but this can offer an excellent opportunity for teaching close observation. After having seen some sign, it is usually better to explain some of the logical inferences you can draw from it rather than just identifying it. For example, if the group is seeing a large (6' - 8') rounded flattened area in some high grass, it would be good to not only identify it as a place where a moose had bedded down, but to call attention to the type of habitat, and what this indicates about moose food preferences and living places.

BIRDS OF ONTARIO

by Phil Shore

The Canadian lake country provides a great variety of bird life. We cannot hope to know many of the birds ourselves, as instructors, and certainly will not expect the students to become experts. They should be expected to learn some of the birds, and know something of the different types that inhabit different habitats. This is probably the best approach to teaching - certain types of birds are customarily seen in certain habitats. There are four distinguishing areas: on the lakes, along the margins of lakes and streams, soaring or perched on dead trees near open spaces, and in the woods. We learn to expect certain birds in each of these areas. Robbins' Birds of North America provides much information and students should learn to use it. The following mentions only the most common birds and should be supplemented with much personal knowledge by the instructors.

One of the most common birds, and almost everyone's favorite, is the common loon. They are frequently seen, and more frequently heard on the lakes. The students will quickly learn to recognize the calls even without prodding by the instructors. This sound epitomizes the north woods canoe country to anyone who has ever been there. These magnificent birds can provide much amusement to all as they go about their business of fishing and gabbling with each other. Sometimes the loon is seen with only the head out of the water. Their size and behavior or call can serve to distinguish them from grebes which are a much smaller bird, usually seen in flocks and with only the head and neck out of the water.

Also seen on the lakes are herring gulls, the ordinary sea gull to most people, and ducks. The common merganser is most often seen. Its distinguishing mark is the brown head and a very long bill. Many of them are molting in the late summer and are unable to fly. Care should be taken not to corner them in narrow bays or chase them in canoes when they are unable to escape except by swimming.

When lake birds fly their outline is distinctive. Ducks fly with their heads higher than the body, mergansers have the head level with the body, and loons have their heads below the body. These distinguishing features are easily seen and can be a great help in identification as well as showing students the kinds of things to look for when observing.

Soaring birds, usually seen from moderate to extreme heights, are the bald eagle, turkey vulture, crow, raven, and hawks. By all odds the most majestic of these, or of any others seen in the area, is the bald eagle. The distinguishing marks are the white head and rump on the adults. They are seldom seen close up, but may occasionally be seen on dead trees near the water as well as soaring high over the lakes and hills. The vulture is fairly common and is the other large soaring bird. It can be distinguished from all others by its outline against the sky. The wings are held in a slight V instead of being flat. Various kinds of hawks are seen, but it takes a practiced eye to know which kind is which. They soar at intermediate to high altitudes. Crows and ravens are seldom as high as the others, and flap more than soar as the move from tree to tree. The raven is the larger of the two and croaks, while the crow caws. In addition the raven has a diamond shaped tail and the crow a fan shaped tail. A little practice should enable most students to distinguish one from the other.

Near the edge of streams and lakes the great blue heron is found. An imposing bird with long legs and a wing span of almost 6 feet, they are frequently disturbed as they fish along a lake shore. They fly with strong slow wing beats. Aside from their size and habitat, the distinguishing feature is a crook in their neck when they are flying. Also seen fairly frequently is the belted kingfisher. They prefer streams to lakes and will fly ahead of a canoe and land on a branch over the water. When you almost catch up to them, they fly off again. They have a rattle-like call.

Another shore bird seen with some frequency is the sandpiper. Consult Robbins for the various kinds. They have rather long legs for their size and bob up and down while walking.

In the woods the students should listen for one of the loveliest of bird songs, the white throated sparrow. Both they and the black-capped chickadee are very common, but more often heard than seen. The Canadian, or gray, jay is sometimes seen around a campsite and can be a nuisance at times after they have become accustomed to man. Medium sized birds with black and white back and maybe some red around the head are woodpeckers, of which several varieties may be seen. Sparrows, including the vesper and swamp, may be seen at times, and juncos are around. Ruffed, spruce, and sharp-tailed grouse may be seen. Some brigades have had spruce grouse walk right into camp, or sit calmly on a low tree while all stand around and look. They will, on occasion, allow people to get within five or six feet. This never fails to be impressive to everyone.

At night the loon calls are frequently heard and at times the barred owl adds its note. This is a series of hoo-hoó, hoo-hoo-oó's and adds a pleasant variety to the night sounds.

As a way of encouraging students to think of the importance of birds in the scheme of things, they might be asked to consider how much their enjoyment of the area depends on the song of the white throated sparrow, the sight of an eagle, or especially the call of the loon across the lakes. Point out how important they are as spreaders of seeds and eaters of insects, where the effect is a matter of life and death and the balance of nature.

Many of the birds we see in Ontario in August and September may be seen further south later in the year as they either pass through on their annual migration or just move south a short distance to escape the most severe winter weather. In the spring, they return north to their summer breeding grounds.

UINTA MOUNTAIN FLORA

by Al Homans

I. General

As with all areas of extreme climate, the mountains afford a clear view of the process of natural selection. This process favors those adaptations which allow the plant to survive to reproduce. In the mountains these adaptations are mostly directed towards the conservation of heat and of water. Although water is abundant in alpine ecosystems, it is available to plant systems only at temperatures above 40°F, and this may be a consistently rare condition at high altitudes. Therefore you find many adaptations common to plants in the mountains and in the desert.

Alpine flora commonly show a number of genetic adaptations over their lowland counterparts. These include:

fleshy leaves (stone crop)
waxy coverings on the stems and leaves (alpine bushes)
very extensive root systems (any alpine plant)
small size (any alpine plant)
furry coverings on leaves and stems (alpine grasses and other species)

These adaptations permit conservation of easily lost water. Furry or hairy leaves also conserve heat. To insure that mountain species will be fertilized in the extremely short gorwing season, alpine species nearly always have flowers brilliantly colored and quite large in proportion to the size of the plant. Finally, one feature unique to mountain plants is that often they form a dense "cushion" which gives the plant a more solid, rounded exterior, reducing wind resistance and conserving heat.

II. Edibles

There are literally dozens of edible species present in the Uintas, but students are likely to be interested only in those few which can also be induced to taste good. Therefore it may be worthwhile to carry along a bit of vinegar with which to make a salad dressing

for a tossed salad consisting of greens from brook saxifrage, dandelion, rock sorrel, and stonecrop, all of which may be found together in wet rocky places like Red Castle, upper Yellowstone, and Ledge Lake. You might also point out that many early settlers suffered and even died from scurvy beneath pine trees whose needles would have made a tea rich in vitamin C (though less than delightful to taste).

III. Identification

There is no substitute for experience and a good field guide for identifying wild flowers, but for coniferous trees the following rule is easy to remember: Spruce needles are square, Fir needles are flat, and pine needles are triangular in cross section and occur in groups (pull one, and several come off in a group). Dominant species in the Uintas are subalpine fir, lodgepole pine, and Colorado blue spruce, also Engleman spruce which is almost indistinguishable from blue spruce (which may or may not appear blue) at high altitudes. Lower down (below 9,500 feet usually) you may find ponderosa pine or Douglas fir and aspen, which is the first tree to reforest avalanche or fire areas.

One concern to be communicated to the students is that every piece of dead wood is a valuable nutrient to mountain ecosystems. The growing season is extremely short, and there have been mountain trees which, though only 6 inches in diameter, have been found to be well over 500 years old. This can easily be demonstrated by breaking a small dead branch (1-2 inches) and having them count the 20-50 growth rings (15-30 of which would not be present on lowland trees where growth is easy). Thus fire size should always be kept at a minimum in high altitude conditions.

UINTA MOUNTAIN FAUNA

by Alan Kesselhein

I. General

The mountain environment provides a number of microhabitats, each of which supports a different animal web. Animals in the mountains are faced with the life struggle (food search and predator elusion) under sometimes extreme climatic conditions. As a result, fauna have adapted structurally and behaviorally to these conditions. These adaptations include additional winter fur, living underground during the winter, moving to lower elevations for the winter months, etc. Due to sheep grazing, animal life has decreased in number and complexity over the years both because of overgrazing and the use of poison.

Because we travel in groups and animal life is extremely wary (except for the Camp Robber Jay), it is unusual to sight a great deal of animal life. Your chances are increased however, if students are encouraged to be observant and if instructors make a point of identifying animal signs. The best times for sighting most animal

life is in the early morning or dusk hours when animals are busy, feeding, watering, and being generally active.

II. Animal life

The lower elevations support a relatively complex animal population because of the less rigorous climate and more abundant food. Between 7-10,000 feet the Uinta Mountains are largely covered by lodgepole pine forests interspersed with occasional meadow and marsh environments. The forests are populated by small chipmunks and dark squirrels, deer, Canada Jays, juncos, and Mountain Chickadees. Moose are only seen on the northslope of the range at lower elevations, most often around the China Meadows area. In the lower meadows Cooper's hawks and Marsh hawks circle close to the grass hunting for small rodents. An occasional porcupine will be seen also.

Lakes and streams provide an environment which supports an entirely different community. Here you will find trout (cutthroat mostly) to be the only kind of fish. Several species of mammal also make use of the lake environment. Muskrat, beaver, and occasional otter all live in lakes. Beaver live in lodges while muskrat and otter have dens under the banks.

At the higher elevations, animal life is greatly simplified by the climatic conditions. Trees are smaller and spaced further apart. Timberline occurs at approximately 11,000 feet and trees are replaced by alpine meadow and tundra environments. Elk are present around the high lakes and meadows, but are very wary of human presence. Coyote also live in the high area, usually making their dens in the talus slopes above timberline. Deer are present although not as numerous at higher altitudes. Also making use of talus slopes are the Pica or Rock Conies which are small (rat size) rodents which live in complex mazes in the talus and make a curious whistling noise. The bird life at higher altitudes is limited mostly to larger species. It is here that you will find Golden Eagles (Mt. Lovenia - Lambert Meadow area especially) and large hawks. Unfortunately, the ever present "Camp Robbers"(Canada jay) are also in the area. There are some Bluebirds at higher altitudes.

III. Sign

Animal sign can be quite interesting because you can reconstruct situations in the wilderness by interpreting sign, even without seeing the animals. It is a good exercise in observation techniques as well.

Miscellaneous

Porcupines will chew the bark of trees once food gets scarce in the winter, leaving large patches in the tree bark.

Beaver chewed logs (mostly aspen) will be found near lakes. They are cone-shaped with obvious teeth markings.

In lakes you can sometimes see the "runs" where muskrat or otter go in and out from their burrows under the bank.

Sometimes you can tell where deer or other large animals have "bedded down" by the matted-down grass circles where they lay.

Tracks and Scats

Moose, elk, and deer tracks and scats are all variations on the same theme with moose being largest and deer the smallest. The tracks are roughly heart-shaped cloven hoof marks and the scats are oblong-shaped pellets occurring in groups.

Squirrels leave small round pellets. You may also see shredded pine cones around the base of trees which would indicate squirrel activity.

Depending on the kind of food they have eaten, pica will leave dry round pellet-type scats or soft moist dung if they have been eating live vegetation.

An occasional owl pellet will be seen. They are regurgitated packages of the waste food (fur, bones, teeth, etc.) from the prey that owls feed on (mostly small rodents).

OJIBWAY INDIANS

by Bruce Jarvis

In the lake country along the Minnesota - Ontario border, the modern canoeist may encounter descendents of the Ojibway (or Chippewa) Indians who now live on government reservations and prove invaluable as fishing guides for local resorts. Judging from the dilapidated appearance of some of their houses, the Ojibway of the 1970's apparently survive under economic conditions shared by other North American minorities. The Ojibway, too, have a rich historical, cultural, and spiritual heritage which helps us not only to understand them better but to realize how closely bound these humans were to their natural surroundings.

According to W. W. Warren's History of the Ojibway Nation, the word "Ojibwa" may have two possible origins. It refers either to the "puckered" characteristic of the seams of the moccasins of the group of Indians known as Ojibway, or the word suggests a particular fate in store for these Indians enemies, that is roasting until "puckered up." Indeed, the Ojibway were fierce fighters who migrated from the Atlantic coast up the St. Lawrence to Lake Superior (ca.1500) As the Iroquois expanded their territory, first as a result of increased strength of the Six Great Nations' unification and subsequently because of pressure from Anglo settlement, the Ojibway, an Algonquin tribe, were forced to move westward. They in turn displaced other tribes, most notably the Dakota Souix, from the rice-rich lands of Minnesota and Ontario.

The annual cycle of activity began in spring, with the end of the hungry season. Families congregated on group-owned maple tree grounds, the "sugar bush," after enduring the winter's isolation in scattered dome-shaped wigwams, structures of permanetly lashed saplings covered with portable woven mats (of reed or cedar bark strips) or with sheets of birch or ash bark. While the women tapped the maples for sap, the men set out on the hunt. After hunting deer, bear, buffalo, wild fowl and fish, the Indians feasted.

On the group's sugar bush the Indians boiled the sap in a central lodge, originally using earthen cauldrons and later metal pots. When the sap became a thick syrup, it was poured into molds to make candy for the children or boiled longer and then granulated by hand in troughs. Because maple sugar was the most available seasoning, the Ojibway used it liberally on fruits, vegetables, rice, and fish. (Other seasonings: bearberry, blueberries, and wild ginger.) In contrast to our culinary habits, salt was virtually unknown among the Ojibway.

Summertime provided a chance to repair implements, to make clothes, trap small game, and to cultivate maize, squash, and beans. Trips were made to various locations to gather wild foods and useful plants. While women farmed and cooked using wooden and birch bark vessels, men stalked the game. Surplus food, both cultivated and gathered, was dried and buried in birch bark storage baskets for use in the winter. From ribs of buffalo and moose, the Ojibway fashioned knives. The inner bark of cedars or the pulverized stems of nettle yielded fibers for fish nets. Beaver skins from trapping efforts served as blankets. Men wore shirts, breechcloths, leggings, and moccasins. Women wore either a skirt and jacket or a one-piece dress along with moccasins. Through out the summer the Ojibway lived in conical, bark-covered shelters near their traditional rice beds.

During the fall season the Ojibway men hunted and the women harvested wild rice in a portion of the group's rice bed which the women "staked out" by tying some sheaves of rice together in their family plots. To harvest the rice, the women sat in canoes and with one stick bent the rice stalks into the canoe and then knocked the kernals off with a stick in the other hand. The kernals were dried in the sun on birch bark sheets, parched on mats over a fire to loosen the husks, pounded with pestles in a barrel, and finally the husks were removed by winnowing. The processed rice was stored in birch bark containers in a large pit and covered with hay to prevent spoilage of the crop which was their winter staple. These caches needed to be protected from frquent raids by the Dakota Souix, who still regarded much of this territory as theirs.

Upon completion of the rice harvest, the Ojibway feasted and retired to their winter wigwams. This was the potentially hungry time, when dried foods which had been buried had to last till spring. Long evenings were spent in the lodges telling myths, and this was the season when much of the religious teaching took place. The yearly pattern of activities, then, proceeded from maple sugar gathering and hunting in the spring to summer cultivation and cloth-

ing manufacture to the fall rice harvest, hunt, and feast before the long winter. An excellent account of the Ojibway daily life is the Bureau of American Ethnology Bulletin 86, "Chippewa Customs" by Frances Densmore.

This semi-nomadic hunting and gathering life-style allowed the Ojibway to adapt quickly to the arrival of the voyeageurs. Beaver and other fur-bearing animals were trapped and their pelts were traded for woolen blankets, needles, and metal cooking pots. Once these were introduced, the Ojibway culture quickly became dependent on manufactured articles. (It is easier to sew a woolen coat with needle and thread than it is to sew deerskin with a bone awl and sinew.) On the other hand, the voyeageurs were dependent on the Ojibway for their supply of furs. It was because of this interdependence that the Ojibway were not pushed westward ahead of Anglo civilization, and today their reservations are in the same areas as their traditional territories were.

The Ojibway differed from that of peoples of the western European cultural tradition not only in the type of agriculture, style of clothing, and mobile seasonal dwellings but also fundamentally differed in their conception of persons, objects, and forces. The impersonal, orderly natural forces explained by European scientists, such as planetary motion, were inconceivable to the Ojibway. Instead, the Indians believed that the spirit or essence within an object or animal, its "manitu" (or manito or manido, etc.), governed the motion or placement of that thing or being. The belief in manitu had important consequences for the relations among the Ojibway themselves, and between the Indians and animals, natural phenomena, and their environment.

A manitu was a vital, spiritual part of the other-than-human persons inhabiting the world. We might call such other-than-human beings spirits, but this is not quite accurate. The Ojibway designated certain folk heroes, such as Winabojo (or Nanabijou), and each of the four winds as manitu. The body of a manitu could metamophose or even disappear, but the essence remained. The changeable body was one difference between a manitu and a human. The vital part of a manitu may have temporarily resided in an object, such as a rock or tree or an animal or even a human. When this occurred, the object or animal was said to have been manitu.

Because one never knew whether a tree or bear, for example, was inhabited by a manitu, the Ojibway carefully observed animals to be hunted or trees to be cut for signs of manitu. Similarly, plants and animals were spoken to and were expected to comprehend. In order to avoid personal harm, pains were taken not to offend a manitu by violating it through needless hunting or timbering. Manitu could have transformed themselves into other people as well as animals. So could sorcerers, humans who acquired the power of metamorphosis by their close association with a powerful manitu. One never knew who was a normal human, who a manitu, and who a

sorcerer. For this reason the Indians, on the one hand, suspected each other of being sorcerers and bringing them bad luck and, on the other hand, treated one another kindly to prevent angering an unknown sorcerer or manitu. As a result the Ojibway treated their surroundings with utmost respect and each other with mild suspicion and social conduct was characteristically cautious and suspicious.

The Indians believed that accidents, bad luck, or injury were caused by the victim's disturbance of a manitu. Their notion of causality was, therefore, personalistic. To remain in the good graces of the manitu, the Ojibway observed natural events with concern for their messages. A thunder and lightening storm was the beat of the wings and the flashing eyes of an angered Ahnemihig, or thunderbird. And where the bolt of lightening struck would be a good indicator as to who was the cause of this displeasure. Dreams were also an important means of contact with manitu.

Although the presence of manitus may have heightened the suspicion and perhaps powerlessness of individual Ojibway, the other-than-human persons were essential for the attainment of "pimadaziwin," "life in the fullest sense." These other-than-human persons put the Ojibway in contact with their surroundings in such a way that mutual obligations resulted. The Indians dared not risk the wrath of an insulted manitu by treating the environment harshly. On the other hand, the Ojibway hoped for guidance from the manitu through dreams, the circumstances of natural phenomena, and behavior of animals. This was the specific purpose of the vision quests which young men took part in. Fasting and lack of sleep were meant to induce the pity of a manitu, and when one appeared in a dream or vision a special relationship was formed with the manitu, and the dreamer was put in closer contact with the other parts of his world. (For added information read The North American Indians, A Source-book by Owen, Deetz, and Fisher.)

FUR TRADE AND THE HISTORY OF CANADA

by Phil Shore

Three natural features of the north woods were crucial in determining and guiding the human history of the area. The glacier formed lakes, the birch, (which in turn nurtured) the beavers. When these three were mixed with the European desire for furs and felts, the stage was set for some of the great dramas of human history in North America.

Until the invention of railroads there was only one practical method of travel over much of Canada. This was the canoe. It was light enough to be carried from one body of water to another, stable in many kinds of water (from lakes to rapids), and strong enough to carry large loads. The white birch, both strong and light, is uniquely suited for making such a boat. It reaches a large size only in a narrow belt which corresponds to the southern edge of the Canadian shield, an area where land and water are so mixed together that purely land transportation is impractical. These are the

other two natural elements which were so influential in molding Canadian history.

The French were the first Europeans to settle or trade in what we know as Canada. Cartier, between 1534 and 1541, sailed in the St. Lawrence, but France only fished off the great banks for the rest of that century. This involved some trade with the Indians, but only as a secondary interest. Such trade, however, led to the discovery of the value of beaver pelts as a trade commodity: low weight, low bulk, and high value. A pelt worth 200 livres in Paris could be bought for 1 livre worth of goods in Canada. Each hair of the beaver's under-fur has tiny barbs which make it an ideal felting material, and felt hats were much in demand.

Early in the 1600's the first settlement was planted, but growth was very slow. Twenty years later only 70 Frenchmen were in the colony and only 15 acres had been cleared. This highlights one of the basic differences between French and English policy in the new world. To the English it was a settlement of Europeans in a new place, but to the French, it was primarily a trading frontier and only secondarily a settlement frontier. This difference was to play a crucial role in the final struggle for domination of the continent.

As French settlement at Quebec attracted Huron Indian traders with loads of beaver pelts, the few French traders, settlers, and missionaries gradually became more numerous. The colony reached 675 by 1650. When in the 1660's the French added troops, the major elements of society were complete. At the same time wars and European diseases decimated the Huron tribe, leaving a vacuum in the lines of trade from the west to the European settlements, the source of European goods. French adventurers and traders moved to fill it.

After 1660 the French explored, traded, and subsequently established trading posts and forts west and south from Montreal. They quickly reached the extreme limits of the Great Lakes, and had posts on Lake Ontario and as far west as Green Bay. They discovered the short portage from Lake Michigan to the Illinois River which led to the Mississippi. By the 1680's Ft. Michilimackinac was a major base for trade of beaver and European goods. It also functioned as a resupply base for food for the voyageurs who engaged in the trade. These scattered posts were the basis for a claim to an empire of continental size - the Mississippi, Ohio, and St. Lawrence valleys, and hundreds of miles to the north and west of the Great Lakes. It was, however, peopled by only a few hundred Europeans, mostly traders, who rarely settled in one place for many months.

The Indians, increasingly dependent on European metal goods, soon forgot their skills with stone, leaving them no choice but to continue to trade for copper kettles, knives, axes, and guns. This dependence on alien goods led to the disintegration of the traditional culture, and can be traced across the continent from tribe to tribe, as European influence spread further and further west.

All this time the British influence gradually increased along the Atlantic coast, while the Hudson Bay Company began to establish posts on the Hudson Bay. Such action was not only a territorial threat to the French, but a direct menace to the very lifeline of the beaver trade. The Hudson Bay Co. posts had the advantage of shorter and more direct trade to Europe, cutting transportation costs for both the trade goods and the pelts, even as they eliminated the middle men in the trade pattern. Both of these made for cheaper goods (1/2 price in Athabasca country). Naturally the Indians preferred to trade with the Hudson Bay Company. This growing competition percipitated a struggle that was to last for about 150 years between the trade centered on the St. Lawrence and that of the posts on Hudson Bay.

In the early 18th century France began exploring the Indian routes north and west of Superior, to Rainy Lake, Lake of the Woods and on to Winnipeg and further north and west into the Rocky Mountains. But while the French were taking on the trade of most of the continent, the gathering force of the English settlements was pushing on their rear. In the 1750's the French and Indian War broke out, ending in the French defeat. The English controll i the continent for a few years until some of the colonists got ideas of independence and successfully revolted.

The defeat of the French empire was of only minor import to the development of the fur trade. The demand for beaver pelts remained undiminished. What changed was the control of the trade. English and Scots took over the old French trade and organized the Northwest Compaay. By the middle years of the 18th century a pattern was established which was to persist as long as the trade in beaver did. The change in political control has little effect in the remote areas.

Each spring as soon as the ice went out, brigades of canoes left Montreal, headed up the Ottawa River, across Lake Nipissing, Georgian Bay, along the north shore of Lake Superior to the Grand Portage. Here they would meet the brigades coming from the north and west, as far as Ft. Chipewyan on Lake Athabasca, 3000 miles from Montreal.

The Montreal canoe weighed 600 lbs. and could carry 60 packs, or approximately three tons. The North canoe weighed only 300 lbs. Both had to be handled very carefully to avoid damage to the fragile bark covering. They had to be unloaded in water to avoid banging or scraping them on the shore. This meant the voyeageurs hopped out of the canoe as they approached shore and unloaded the canoe in what was often waist deep icy water. It took 4 men to carry a Montreal canoe, and two for a North canoe. The loads were made into 90 pound packs. Each man was responsible for carrying 540 pounds across a portage. They regularly carried two of the packs at a time, and sometimes three or four. Incredible as it seems, they trotted across the portages. They didn't create the travel routes, but used traditional Indian routes - often thousands of years old. The portages we use today are mostly the traditional ones which have been in use since the Indians first se[illegible] and explored this country.

The pattern of meeting midway was developed because there was not enough time to travel from the western trapping areas to Montreal and get back in one ice-free season. The smaller waterways in the interior were traversed by the smaller North canoes and the large lakes and rivers by the Montreal canoes. This way each brigade had only half of the trip to cover. Grand Portage became the center for exchange of goods as well as a place for wild parties and much visiting for a couple of weeks each summer before everyone headed back to their winter quarters.

The canoeists gave rise to one of the great folk heroes of North America - the voyeageur. These men were mostly small, but very tough. A normal day consisted of about three or four hours of paddling, then a stop for breakfast, then another 12-14 hours of paddling, broken only by the hourly five minute pipe - a time for a rest and a smoke. Supper, the only other meal, was after dark. There was no protection from mosquitoes, black flies, or the weather. The only variety came from the portages, which were often worse than paddling, or from rapids, which occasionally meant a capsize and drownings. The most notorious portage was the Methye in northern Saskatchewan, 12 miles long and sporting a 700 foot cliff toward the northern end.

The voyeageurs covered great distances. There is one recorded instance of a crew paddling 79 miles in one day. Modern canoeists would consider that four days' hard work. The food for the Montreal voyeageur was a thick soup made of dried peas or corn. Sometimes it was seasoned with a little pork, thus the nickname "porkeaters" for the brigades from Montreal. Even today there is available commercially a Habitant Pea Soup which is thick and has bits of pork in it.

Pemmican was normally eaten by the north brigades. It consists of sun dried, pounded buffalo (or moose) meat, sometimes with berries added, with melted tallow poured over it. A daily ration consisted of three or four pounds per person. When pemmican was cooked with water and a little flour it was called rubbaboo. This was long on quantity, and very nutritious, but short on variety.

Canoes were repaired with birch bark, wattape (rootlets of spruce trees for sewing the bark), and pine pitch, for sealing the joints. Each night before supper could be eaten every canoe had to be inspected for needed repairs.

The rivelry between the Northwest Company and the Hudson Bay Company continued into the early 19th century, when the Hudson Bay Company gradually won because of advantages of better management and the cheaper goods occasioned by the shorter trade routes and absence of middle men. But by this time, beaver was scarce over most of the area and prices were rising, about the same time, the fashion changed from felt hats to silk hats. The result was a relatively quick collapse of the fur trade.

The fur trade left an indelible mark on North American history. The Canadian-U. S. border from Lake Superior to Lake of the Woods is described in the treaty of peace between Great Britain and the rebels as "through the middle of said Long Lake, and the water communication between it and the Lake of the Woods." In other words, it was the main canoe route west of Grand Portage. Since fur trade depended on the Indians the official attitude toward them was in marked contrast to that of the U. S. The Indians were considered as valuable citizens and, unlike in the United States, there was no history of exploitation and extermination. In a real sense the fur trade determined where and what Canada is today.

THE FUR TRADE AND FAR WESTERN EXPLORATION

by Douglas Steeples

There are few more exciting, or intriguing, stories than those of the exploration through the American far west. Quite properly people tend to see in those stories tales of heroes writ larger than life, and records of the deeds of men who stood taller than ordinary human beings. Also quite properly stories of the exploration of the far west bring together many of the most illuminating strands of American history and development. All of these themes, and others, were clearly delineated in the first, and possibly the greatest of the stories of western exploration, the record of the travels of Meriwether Lewis and William Clark.

The Lewis and Clark expedition had its origins in the mind of President Thomas Jefferson, in American culture, and in a tangled web of international politics. Jefferson's instructions to the expedition spun out many of the most important domestic themes. The explorers were to discover a water route to the Pacific, that is, to complete the search for the long sought North West Passage. Long since, explorations on the Mississippi, St. Lawrence, McKenzie, and other rivers had eliminated the far north and far south as possible routes. All that remained was a possible central route up the Missouri River. This route had captured the imagination of explorers as early as the expedition of Marquette and Joliet in 1681-2. In 1763, Robert Rogers proposed that the Missouri itself could be ascended and that a portage from the Missouri would easily take travelers to the great river of the west, the River Ouragon. Two years later Rogers actually dispatched a modest expedition up the Missouri.

Jefferson, in addition, instructed Lewis and Clark to survey the natural resources of the lands through which they should pass, examining the character of soil, vegetation, and animal life. They were also to explore the possibilities of peaceful trading relationships with Indian tribes along the way, and to acquaint the tribes with a recent transfer of ownership of the Louisiana Territory from Spain and France to the young and burgeoning United

States. Concealed behind these instructions lay not only a determination to find a commercial route to the Pacific, and to make good America's political claims, but also the story of the Louisiana Purchase, and in terms of Jefferson's interest in the resources of the areas to be explored, the President's conception of the ideal society. Jefferson's ideal society was founded on a population of independent land-owning farmers, and such a society required above all else land.

Finally, the expedition instructions to seek out curious animals reflected a raging scientific argument. The Comte de Buffon of France had long argued that the New World was in every way inferior to the Old: its natural species of plants and animals smaller, less numerous, less fertile. Jefferson, stirred by reports of mammoth bones in Kentucky, hoped Lewis and Clark would disprove the Frenchmen and confirm the superiority of America. Here was a note of cultural nationalsim --of seeking reason to express pride in a raw, young country which had had little time to develop refined ways and so must draw on nature for inspiration.

In Meriwether Lewis and Clark, Jefferson had selected an uncommon pair of men to lead the exploration of the century. Lewis was the President's cousin and personal secretary, a mercurial somewhat introvertive young man, of distinguished intelligence. Few knew Jefferson's mind as well as he, and Jefferson had assured careful preparation for him. The young man had undertaken special scientific studies in the American Museum of Natural History belonging to Charles Wilson Peale in Philadelphia. He was also conversant with surveying instruments and techniques, while his military career involved command experience and field experience dating back to the whiskey rebellion in Pennsylvania in the 1790's.

William Clark the younger brother of George Rogers Clark, was Lewis' complement. He was stable, extroverted, a skilled riverboatman and woodsman, and an effective negotiator with Indians. Clark, too, had enjoyed long years of military experience. Lewis himself selected Clark as his co-commander.

In April, 1804, with a company of 14 soldiers, nine Kentucky hunters, an interpreter, and two French boatmen, the little party set out from St. Louis in two pirogues and a 55-foot keelboat, bound for the Mandan villages in South Dakota. These villages were reached on the 25th of October after several months of back-breaking toil, accomplished with few intervals of adventure to relieve the tedium of work or the unremitting attacks of clouds of "muskeeters."

The first dramatic event of the first stage of the expedition was an encounter with the Teton Sioux. These Indians had for some years terrorized the upper Missouri, effectively closing it to trade from St. Louis and points below. They menaced Lewis and Clark, at one time stringing their bows and reaching for their quivers. However, Lewis and Clark stood them down, pointedly aiming at them the air cannon on the keelboat. When the Indians yielded, their power was broken, and the Missouri was open to river traffic.

The expedition wintered at Mandan, during which time the two captains diligently sought out information from Indians about the unknown lands that lay to the west. While at the Mandan villages Lewis and Clark were visited by representatives of the Northwest Company, a great Scottish fur trading firm headquartered in Montreal, which hoped to attach one of its members to the Lewis and Clark expedition so as to avail itself of knowledge of their discoveries. Before winter was over the two captains had sent back down the river a larger collection of animal skins, a body of field notes, and other materials which are now housed in the Smithsonian Institution. And they had begun to plan ahead for the formidable tasks of the new year.

On the 7th of April, 1805, the party--now minus its keelboat and keelboat complement--began to move up river. Ice still lay along the edges of water. It was with great difficulty amid unpredictable weather that the expedition forced its way forward each day. The portage around the great Falls of the Missouri in Montana took three weeks to accomplish and was a notable feat of engineering. While en route, the explorers attempted to make contact with Indian tribes, passing out certificates of good conduct and medals while designating certain figures chiefs of the tribes that they encountered. Happily when threading their way through the mountains, they encountered a band of Snakes, one of whom was Sacajawea, the wife of their interpreter Charbonneau. With her assistance they learned from the Snakes the way through the mountains. They crossed the continental divide on Lemhi Pass, after abandoning their boats well over a mile above sea level. Thus reluctantly they parted with their dream of a Northwest Passage. After crossing Lemhi they were in the watershed of the Salmon River, down which they tried unsuccessfully to pass. Forced back, they moved north, over Lost Trail Pass into the Bitteroot Valley and moving down that valley to the junction of Lolo Creek with the Bitteroot River. Here they rested for a time, learning of a four day route back east to the gate of the mountains from which they had now toiled 52 days, before turning west up the Lolo Trail over Lolo Pass and into the watershed of the Clearwater River, which they descended to the Snake, and then navigated to the mouth of the Columbia. They reached the ocean in autumn of 1805 and the Journals note "Ocean in sight. Oh the joy!"

After wintering at the mouth of the Columbia amid continually miserable weather, the party started east. By that time Lewis and Clark had assembled their field notes and interpreted the geography of the West to the extent that they were aware that there was no easy water route across the continent. Instead of an anticipated 20 mile portage, they had encountered a 200 mile trek through the tangled maze of Idaho's mountains. Moving e[illegible] they purchased horses from the Indians, symbolic of their abandonment of the dream of the Northwest Passage. They forced a difficult passage along the Clearwater and over Lolo Pass in snow that was up to their horses' bellies. Splitting, with one unit descending the Yellowstone River while the other crossed through Hell Gate Pass to the Missouri, they rejoined at the mouth of the Yellowstone, but only after Lewis had injured his arm and nearly lost his life to a party of Blackfoot Indians. The return trip down the river was passed almost without incident, the party moving eighty, ninety and even a hundred miles

in a day. They arrived in St. Louis in September 1806 after two years in the wilderness.

Thus, in brief compass, was the story of the expedition of Lewis and Clark. Its achievements, and the changes that occurred while it was in the field, far transcend even the great interest of that story. The Journals of Lewis and Clark are remarkable scientific, as well as historical, documents. Through the Journals one may learn of the former ranges of native American wild life. For example, the Journals first note the presence of beaver at the edge of what is now Kansas. The first grizzly bears were encountered on the 29th of April 1805 not far above the Mandan villages and far out on the plains. The explorers were lucky in dispatching their first grizzly with only two shots, which led them to an over-confident estimate of their hunting powers. Within a week, two more encounters led them to revise their earlier impressions. The second grizzly had died after receiving eleven bullets in its lungs, and then only after having swum to an island half way across the Missouri River, roaring the whole while, and taking twenty minutes to die. The animal was dissected, and the Journals soberly noted that it was the most "tremendous" looking animal that the explorers had ever seen. By the 5th of May the Journals were able to note "I find the curiosity of our men pretty well satisfied with regard to this animal." Similarly, the Journals described what could only have been California condors as far north as the mouth of the Columbia. The Journals are, in addition, priceless sources into the ethnology of the Far West. They contain detailed descriptions of major Indian populations encountered in the course of the expedition. They also record the successes of Lewis and Clark in dealing with the Indians. It should be noted that the explorers not only broke the power of the Teton Sioux, but that they established friendly relations with the Nez Perce and Flathead Indians, which were never afterwards broken.

The explorers in addition found two routes through the Rock Mountains to the Pacific, covered the landscape with names that are still familiar--Hells Gate, The Gates of the Mountains, The Forks of the Missouri, Traveller's Rest, Great Falls, Clarks Fork, Marias River, Jefferson, Madison, and Gallatin Rivers, added many names for newly encountered species of plants and animals--Clark's Nutcracker, Lewis' Woodpecker, Big Horn, grizzly bear, and dozens of others.

Throughout the whole undertaking they exhibited an unparalleled geographic understanding and intuition, and superb qualities of leadership. When, while traveling up the Missouri, they reached the junction of the Marias River and the Missouri, the men in the expedition proposed that the stream entering from the right was the true river. Lewis and Clark studied the confluence of the two streams for a hour or two and announced that the stream coming in from the left was the Missouri. The members of the expedition insisted on exploring up the Marias River and it was only after a few days had passed that they acknowledged that Lewis and Clark were right. Similarly, while traveling through the tangled mountains of Idaho, Lewis and Clark upon reaching the Clearwater River correctly concluded that the Clearwater and the Salmon were both tributaries of the third river which they had not yet seen, and which we know today as the Snake.

As for leadership, there was only one serious breach of discipline during the two years of expedition, and only one life was lost during the trip. That life was lost due to acute appendicitis, and there was in all of the world no medical treatment that could have saved it.

With the publication of the first edition of the Journals of Lewis and Clark in 1814, it is fair to say that the West came into existence. Instead of a mere hundred miles separating the continental divide from the Pacific coast, Lewis and Clark had discovered a vast region six to eight hundred miles in breadth between the crest of the Rockies and the coast ranges. More than that, they had mapped their route accurately through the entire region. They had been there, and their Journals and maps were a beckoning call for others to follow, while the descriptions of resources and fur-bearing animals also served as lures.

Still, there was much work to be done. One of the myths responsible for the expedition had been a conception of the continent of North America which assumed that somewhere in the heart of the West there was a height of land from which four great rivers flowed in different directions to the sea. This common height of land divided the waters of the rivers of the West from those of the Missouri watershed, from those of a north-flowing river and from those of a southwest-flowing river. There was, of course, no basis in fact for such a hope. But the hope itself was a reflection of the power of myths, including the myth of a symmetrical continent. Over the next two generations, the great river of the West was to migrate from point to point until, finally, explorers had ascertained for once and all that it was not there.

In the meantime the achievements of Lewis and Clark stood as an inspiration for others to emulate. Their map, as it extended to the region through which they had traversed, was a model of accuracy. And yet their explorations omitted far more than they included. Yet to be found and mapped were the Great Basin, the Sierra Nevada, the whole Plateau Province, the San Juan, Ymapa, Green, Owyhee, Humbolt, Bear, and Gila Rivers, the Great Salt Lake, the great parks of Colorado, to name only a few land forms. It was only in the 1820's and afterwards that a new wave of exploration would bring Americans into these regions. The 1820's brought a new thrust of exploration into the Northwest, the country that was by then known as the Oregon Country.

The explorers who were to enter and spy out the mysteries of the geography of the Oregon Country entered a region that was splendid in its natural resources and appearance. Among the principal Indian inhabitants, moving roughly from the Canadian border southward, were the Blackfeet. Their allies, who lived largely in the mountains at the western edge of the plains, the Snakes or Shoshone, the Utes, and somewhat to the east the Crow, who inhabited the valley of the Wind River during winter and who in summer moved out onto the plains.

The economy of the Indians was in a process of change by the 19th century. Horses, the off-spring of horses stolen originally from Spanish ranches, reached the Canadian border only in the 1780's.

Their appearance revolutionized Indian life, permitting the brief flowering of the now familiar horse-buffalo culture of the plains Indians. Before that time, the plains Indians had to travel by foot, depending upon the dog as their only beast of burden. Now, with horses, they became highly mobile nomads able to follow the great herds of buffalo that darkened the prairie. There was a seasonal flux, too, as in summer the plains tribes followed the buffalo.

The movement of tribes out onto the plains opened the western edge of the plains to use by some of the mountain tribes for a few months each summer. When fall and winter returned, however, the mountain tribes returned to their fastnesses, as the plains tribes reoccupied traditional wintering grounds.

Despite the incredible wealth that nature provided, the Indians who inhabited the region that lay in the eastern portion of the Oregon Country were in many instances extremely poor. The hunt was a chancy proposition at best. Lakes and rivers teemed with trout, salmon, and other fish; beaver, muskrat, otter, and other water life abounded, and many portions of the mountains were stocked abundantly with deer, wapiti, moose, and other big game animals. Even so, the crude bows and arrows and the cheap trading muskets available to the Indians often offered a scanty return. The Journals of Lewis and Clark left a somber picture of the hardships endured by the Snakes, confined as they were to the mountains. On one occasion, a whole day's hunt involving all of the warriers of one band of Snakes produced no game whatever.

Lewis and Clark passed through this country 1804-1806. Another American foray occurred in 1808 and the immediately following years. John Jacob Astor was an immigrant from the tiny village of Waldorf in Saxony who had come to the states as a peddler of musical instruments and then entered the fur trade. In 1808 he launched his American Fur Company with a post on the Great Lakes. Astor's initial design was to establish a system of trade extending westward over land from the lakes that would forge an overland link with a second network of posts radiating outward from Astoria, a post that he planned to support by sea, at the mouth of the Columbia River, in 1809. The War of 1812 saw Astoria reduced to British control, and the Oregon Country had to wait for many years before Astor's horses returned. By the 1820's however, Astor's American Fur Company was again sending its forces out from its main bases in the vicinity of the Great Lakes.

The American Fur Company was about to enter into a fierce competitive struggle with another great trading complex that operated to the north and west of it, the Hudson's Bay Company. These two companies, while antagonists for control of the fur trade, operated in much the same manner. Each depended on a system of fixed forts or posts, all of them fortified with log palisades, and typically with projecting towers at two corners on opposite sides of the establishment. So stoutly built were these posts, so resistant to the weapons of the Indians were they, that not one of them ever fell to Indian attack.

In the 1820's, as Astor's American Fur Company was beginning to reach west, the Hudson's Bay Company was extending its influence south and east. Its main post in the Far West was Ft. Vancouver, situated on the north bank of the Columbia opposite the mouth of the Willamette. There, a genial Scottish giant, the six and one half foot Dr. John McLoughlin, presided over the rapidly expanding establishment. Surrounding Ft. Vancouver were hundreds of acres of grain fields, orchards, and pastures.

In the interior, the Hudson's Bay Company was in the process of establishing a series of posts that would permit it to tap the trade of the Flatheads, Nez Perces, and other far western Indian tribes. Its expansion followed the design of the superintendent of the Columbia Department, George Simpson, who proposed to create a buffer between the advancing Americans and the zone of British influence, by stripping the intervening territory bare of all fur-bearing animals. In executing this design, Simpson revitalized or established interior posts at Walla Walla, Okanagan, Colville and dispatched brigades of employees of the Hudson's Bay Company to penetrate the most remote regions of the interior of the Oregon Country on hunting expeditions. His partisans, among them Etienne Provot and Peter Skene Ogden, engaged in a masterwork of exploration that rivaled the achievements of the Americans advancing from the east. Provot was in fact the first man of European descent to cross the Great Basin from north to south. He was also probably the first European man to lay eyes on the Great Salt Lake.

On the 13th of February, 1822, newspapers in St. Louis carried advertisements that heralded the entry of a third rival for control of the far western fur trade. On that date the Rocky Mountain Fur Company advertised for a corps of a hundred young men to travel west to the mountains to trade for periods of one, two or three years. Thus began the operations of Andrew Henry and William Henry Ashley. These entrepreneurs were cut from a classic western cloth. Ashley was Virginia born, and had moved to Missouri in 1805, where he rapidly won wealth and prominence. His fortune rested on the development of saltpetre deposits, useful for armaments in the War of 1812, and an ever-widening range of trading activities. Andrew Henry had become his partner, developing lead mines that also rendered useful service on the frontier of the War of 1812. As representatives of their time, both Henry and Ashley were alert to the main chance. Together, they revolutionized the fur trade of the Far West, and helped to assure that ultimate control of the Oregon Country would rest with the United States.

Later in the spring of 1822 the Rocky Mountain Fur Company dispatched a party of one hundred men up the Missouri River to establish a post at the mouth of the Yellowstone. The intention was to operate in the familiar manner of trading companies, from a fixed post to which Indians would bring furs and exchange them for trade goods. The post was successfully established, but a return party moving down the river that summer ran into trouble at the Arikara villages. Situated some miles downstream from the Mandan villages, the two Ree villages were inhabited by some thousands of Indians of unpredictable temper. As the procession of Rocky Mountain Fur Company

boats moved downstream, the Rees attacked. In this attack, the company lost several men, and utter disaster was averted only by the emergence of one of the most remarkable leaders in the annals of the Far West, Jedidiah Smith, then twenty-three years old. Smith managed to rally a defense on a sandbar, and secure the safe retreat of the surviving members of his party. So conspicuous were his qualities of leadership that he was selected to travel overland six hundred miles, along a route that no white man had ever seen, to tell the men behind at the Yellowstone that they would have to evacuate the post the following spring. Smith got the message through, and in 1823 the fort was evacuated. Before its occupants left, a minor episode in the history of the frontier was played to completion.

Among those who had remained at Fort Union was the celebrated riverman Mike Fink, a figure who was the stuff of legends. He was renowned the length of the Ohio and Mississippi Rivers for his boasts that he was half Horse and half Alligator, and his notorious habit of jumping in the air and clapping his heels together while roaring that he loved the "wimming" and was "chock full of fight." Fink and two friends, Carpenter and Talbot, had remained at Fort Union. During the winter months Fink and Carpenter had fallen out several times, probably over a woman who had remained behind in the states. Each time they had made up. Shortly before the party was to move downstream in the spring of 1823, Fink and Carpenter patched up a new quarrel. Just to prove that things were right Fink proposed to Carpenter that the two replay a familiar game shooting cups of whiskey off one another's heads at a distance of seventy paces. They tossed a coin to see who would shoot first, and Fink won the toss. After Fink fired Carpenter pitched to the ground face forward, a bullet squarely between his eyes. Fink stared reflectively at the muzzle of his gun and then said, "Carpenter, you spilled the whiskey." Some weeks later, just as the party was preparing to abandon the fort, Fink boasted that he had murdered Carpenter. Talbot immediately drew and fired, killing Fink. Fink was buried close to Carpenter's grave. Some weeks later the story ended when a party of Blackfoot Indians appeared on the scene, discovered the graves, dug up and dismembered the putrefying bodies.

It was also in 1823 that Lt. Henry Leavenworth led a disciplinary party against the Ree villages. His expedition was a complete fiasco. Hundreds of Teton Sioux allies deserted after he showed a lack of resolution. Leavenworth himself earned the abiding contempt of traders and mountain men when, after cannonading the Ree villages for two days, he decided that they were impregnable and withdrew. Thus the Rees effectively closed the upper Missouri to traders.

It fell to Ashley to decide what to do next. He turned to the young Smith and instructed him to lead a party overland and open an overland route to the fur country in the western mountains. Smith ascended the White River in South Dakota, crossed through the Bad Lands, and nearly met his death in the Black Hills, when he fought a grizzly bear. One swat of the bear's paw lifted Smith's scalp from ear to ear. He somehow held onto consciousness

long enough to tell his men how to sew his head back together. Afterwards he grew long hair to conceal the scars. After a rest of some few weeks his party moved on to winter quarters in the Wind River Valley of Wyoming, the winter home of the Crow Indians. There Smith remained for some months, gathering information and attempting to unravel the mystery of a route across the continental divide.

In March of 1824, Smith and his companions set out up the Popo Agie, striking southeast around the flank of the Wind Rivers through South Pass to the Green River. In doing so they rediscovered what was to be the principal route into the Oregon Country. They narrowly averted starvation, falling on a Rocky Mountain Big Horn Sheep in the midst of a blizzard. The summer of 1824 they trapped the Green and its principal tributaries, ranging widely throughout the Uintas of northeastern Utah, and naming many of the principal streams for members of their party. That summer Ashley arrived from the East himself, and added to their explorations of the Green River. Ashley attempted to navigate the Green in a bullboat, moving down through the canyons of the Uintas and Split Mountain to the valleys that lay up the southern flank of the range.

This trip allowed one member of Ashley's party to spin a fine yarn. Jim Beckwourth, half black and half white, who later persuaded the Crow Indians that he was a long lost chief, spun out of this episode a story of the "big suck." This was a whirlpoot that supposedly vexed the surface of the Green, and threatened all boats floating on it. Beckwourth claimed that Ashley fell out of his boat, and that Beckwourth (who really could not swim) dumped into the suck and singlehandedly saved his chief.

On the basis of the spring hunt, which may have yielded as many as ten thousand beaver pelts, Ashley arrived at a plan that would transform the fur trade. Instead of depending on fixed posts, he concluded that it would be less expensive and more profitable to arrange for fur trappers both in the employ of his company and on their own to rendezvous each summer at a predetermined point to exchange their furs for trade goods. Thus the rendezvous system was born, which depended on an overland supply route from the United States to the beaver country (whose heart was the watershed of the upper Green extending from the Wind Rivers and the mountains of the Montana border southward to the Uintas in Utah).

In the fall of 1824 Smith trapped into Idaho and wintered at a Hudson's Bay Company post. The following spring he trapped ahead of a rival trapping party in the employ of the Hudson's Bay Company. He managed to strip the country just ahead of his rivals for the entire spring hunt down into the Bear River Valley of Utah. In the Bear River Valley another party of Americans was able to seduce many of the Indian employees of the Hudson's Bay Company, and forthwith they deserted with their furs and left the Hudson's Bay Company with a disastrously unprofitable spring hunt. The following years, Smith, by now a giant among his fellows and one of the most famous of the mountain men, joined with David Jackson and Bill Sublette to purchase the Rocky Mountain Fur Company,

which was henceforth known as Smith, Jackson and Sublette. Still modest and quiet in manner, still a Bible-carrying Methodist, Smith in 1826 began the next chapter of his epochal explorations. That fall Smith with a party of companions moved through the forbidding plateau country of central Utah to the gloomy colorful canyons of the Virgin River and then to the Black Canyon. Following the Colorado River to the Mojave Indian villages at about the site of modern Needles, California, they crossed the desert to the gates of the mountains flanking the Pacific coast that fall. They crossed the San Bernardino Mountains by means of Sawmill and Devil's Canyons and appeared before the Mission of the Archangel Gabriel. The Mexican officials hardly knew what to do with Smith and his associates. So uninterested in furs were they that their language did not even have a word for beaver trappers, and Smith and his companions were designated pescadores (fishermen). They were soon ordered to leave California, the Mexican authorities rightly fearing that they were the vanguard of a movement of Americans across the continent.

Instead of leaving the province, whose boundaries were at any rate uncertain, they crossed back over the San Bernardino Mountains, then turned northwest through the Antelope Valley and entered the central valley of California, where they began a new hunt the following spring. In late spring Smith and two companions decided to return to rendezvous on the Bear River in Utah, carrying news of what they had discovered. They forced a passage of the high Sierra, in May through deep snow. They probably descended Walkers River into Nevada and there their tracks disappeared for some twenty days. Their exact route is still unknown, although it is known that towards its end, out of water, two members of the party despaired of moving on. Smith, however, smelled water, followed his nose to a spring, and carried water back to his companions. They then managed to reach Utah, to cross the swollen rivers entering the great Salt Lake and make rendezvous. After rendezvous, Smith with a new party retraced his steps of the previous fall, and prepared again to cross the Colorado River at the Mojave villages. While crossing they were set upon by the Indians, who captured most of their live stock and killed a number of Smith's companions. He thus had the unfortunate distinction of having survived the two worst massacres to which mountain men were ever subjected. He and his companions made a nine and one half day forced march on foot through the desert and were able to rejoin the balance of his party in central California at the end of 1827.

The following spring Smith and his companions, having traded for several hundred head of horses which they proposed to take back to rendezvous with them and sell at a handsome profit, began to trap their way northward along the western flank of Sierra. Near the site of modern Redbluff, California, they turned into the coast ranges in an attempt to reach the sea coast and move up the broad Pacific beaches into the Oregon Country. They had unwittingly entered the most confused region of mountains in all of the United States, the Trinity Alps. At times their path was so difficult that they could make only a half mile in a day. They finally reached the coast and moved north into Oregon turning inland on the Umpqua River. There Smith lost his entire party except for himself

and one other man to a massacre by the Umpqua Indians, the third great massacre of mountain men. He somehow made his way to Ft. Vancouver, where Dr. McLoughlin promised to restore his furs, and did so. In 1829 Smith appeared back at rendezvous, with the proceeds of the sale of his furs to the Hudson's Bay post in Oregon.

In the space of two years he had seen more of the Far West than any other living man. Also in the space of two years, he had provided virtually no profit for the firm of Smith, Jackson and Sublette. He accordingly devoted the next two years to intensive beaver hunting, crossing the mountains from the Blackfoot country in western Montana south into Colorado. He retired in 1830, with his partners selling out to new owners, among them Jim Bridger. Having made a fortune he returned to St. Louis, and entered the Santa Fe trade. In 1831, while on his first trip to Santa Fe, he disappeared. His personal equipment turned up later that year in Taos, New Mexico. With it was a report that while looking for water on the Cimarron Cutoff of the Santa Fe trail he had ridden over a rise and found a water hole. Unfortunately a band of Comanche warriors had found the same water hole. Before losing his own life Smith had time to get off one shot, which killed two Indians sitting astride the same horse.

Before his death in 1831 at the age of 32 Smith's explorations had carried him so far and wide as to leave a priceless legacy. He had found South Pass, explored the Big Horn Basin, traveled through the parks of Colorado, determined the relationship of the sources of the Missouri, Arkansas, Rio Grande, and Colorado, as well as crossing the Sierra, investigating the central valley of California, making a transit of Nevada, and forcing an overland route from the Oregon Country back to rendezvous territory along the upper Green River.

Among his achievements, then, were two routes to California. In addition he left a significant written record, including at least one letter to the Secretary of War of the United States, informing him fully of the resources of Oregon. Smith, was a man of his country and times. While engaged in beaver trapping, he was alert to the possibilities of long range development. While his journals were lost, his discoveries were not. The best map extent of Oregon in the 1840's was sketched to reflect the discoveries of Smith, and it was in the procession of American settlers in the Oregon Country. The cartographer of the House of Representatives in 1839 added Smith's sketches to his own map.

While Smith was completing his odyssey, Astor's American Fur Company assumed a menacing new aspect. Since its retreat in 1812 to the Great Lakes it had confined itself to the classic canoe-borne, fort centered trade that had been perfected by the French in Canada in the seventeenth and eighteenth centuries. In 1827, the American Fur Company organized its upper Missouri outfit. Two years later it established Ft. Union at the mouth of the Yellowstone. Its first party penetrated the mountains in 1830 under the great partisan Kenneth McKenzie.

This tripartite competition in CAFC, RMFC, HBCS had the effect of making the fur trade more risky and speculative than ever. Each summer during the 1830's as many as eight hundred mountain men and up to two thousand Indians gathered for two weeks of debauchery in some remote western valley. The trappers quickly spent the proceeds from the fall and spring beaver hunts, paying extortionate prices for trade goods sold to them by the Rocky Mountain Fur Company, which then ended up with its furs and what it had paid to get them, and more. Ashley's Rocky Mountain Fur Company secured profits of up to two thousand percent on the trade goods that it made available for its employees and to the free trappers. Flour that sold for two cents a pound in St. Louis customarily fetched two dollars a pound at rendezvous. Cheap calico cloth worth fourteen cents a yard sold for up to ten dollars a yard, while gun powder and lead fetched a dollar to a dollar fifty each per pound, as against one to two cents in the East.

In addition to selling trade goods at such a high markup, the fur companies secured up to sixty thousand dollars worth of beaver pelts each year. After rendezvous the trappers returned to the mountains for a fall and subsequent spring hunt. The beaver were inactive in their lodges in the winter months. The hunters themselves engaged in back breaking and dangerous work, traveling in parties of five to six men, each with several head of horses, and five to six pack mules. Daily they spent three to six hours in ice cold water up to their waists, setting underwater traps. These traps were firmly anchored so that once the beavers were caught they would drown. If they were trapped at places which permited them to breathe, the beaver would chew off the trapped limb. From trapped male beavers the mountain men removed the sex glands, to extract castor, the substance which was used to bait new traps. Traps were placed along the runways by which beavers left the waters to feed on grasses or cut wood to build their dams.

Stewart Udall in his book THE QUIET CRISIS (1963) describes the mountain men as white Indians, and so they were. They were the prime example of cultural regression in the frontier influence. Carrying their Hawkins rifles cradled in their arms, they wore the fringed buckskin breeches and breech cloths of Indians, moccasins and cotton shirts and leather jackets. In winter they wrapped in buffalo robes or capotes. About their heads they wrapped filthy bandanas. They moved each night or at best every other night during the hunting season, retiring to winter lodges for warmth. There, they often kept the company of an Indian squaw who served as wife and companion. Bernard De Voto in his book ACROSS THE WIDE MISSOURI (1946) asserts that young Indian squaws were far more refined in the arts of womanhood than their white counterparts to the East. Accomplished in the arts of love making, domestic skills, and ways of making themselves attractive, they were fit companions for their mountaineering husbands. Many mountain men were in fact adopted into Indian tribes, at least for the winter season. Upon resuming their wandering ways in summer, however, they usually became fair game again.

Success as mountain men depended upon refining skills for which the Indians were famous. Mountain men had to develop memories for geography that never failed, for the price of failure was death. Jim Bridger was as good an illustration of this trait of mountain men as any. Periodically while traversing a valley, Bridger made it a point to turn and look back for periods of several minutes, so as to fit into his mind the appearance of the valley from both directions. So masterful had he become in recalling the features of geography that in later life he could return to valleys that he had not seen for periods of ten years or more, and still recall the way through with no difficulties at all. When in 1861 the United States Army was charged with surveying a road across the Rockies to Salt Lake City, Captain Lt. Berthoud consulted with Bridger. Bridger squatted in the sand and drew a map of a route from Denver to Salt Lake City. When he was questioned, he took Berthoud along that exact route, covering it in a period of weeks. His memory and selection of route was so good that today United States Highway 40 runs along the course that Bridger marked.

The mountain men were Indians in their personal habits as well. They tended to speak in high nasal voices, and to punctuate their conversations with a series of grunts, waghs, and ughs. At rendezvous and elsewhere, for amusement, they often danced together, there being no women available. Jim Bridger nearly drove one officer to distraction by sitting up late at night in his fort and banging on a pie tin while singing Indian. This was the same Bridger, an illiterate, who sat up for hours upon hours while a young lad read Shakespeare to him, that is, until the lad read Richard the Third. Upon hearing of a king who had had two little boys put to death, Bridger insisted that he would hear no more of that Shakespeare. Later he spouted long passages committed to memory, interspersed with glorious oaths.

The mountain men ate as Indians too. Their diet consisted mostly of meat; the standard daily ration for an employee of the Hudson's Bay Company was eight pounds of buffalo meat. There are documented records of hungry men striking their first buffalo after a long period of short rations, eating eight pounds, and after resting a few hours building up their fires and consuming yet another eight pounds. There is also the testimony of one French traveler who saw two mountain men sitting on a dirty apishermore (saddle blanket) with a mound of buffalo gut or boudin between them. Each was eating the gut, from the opposite end, sliding it down his throat without even chewing it, and periodically urging his rival to feed fair. So eager were they for this delicacy that occasionally one or the other would give a jerk, in the process of which several inches or as many as three feet of gut were jerked out from the belly of his companion. When food was short, mule ears, horse blood, boiled moccasins, grasshoppers--even ants secured by placing a hand on an anthill until it was covered and then licking them off--provided nourishment.

The mountain men also regressed to fighting as the Indians did. After one rendezvous, a party of Blackfeet fell upon a party of mountain men and ran off with their horses. Fortunately, the raid occurred close enough to rendezvous to permit the bringing up of reinforcements, and one of the chiefs of the Blackfeet was captured.

A parley ensued in which the mountain men offered to exchange the chief for their lost horses. The Indians talked it over for a while, and then allowed as how they would keep the horses. The mountain men then built up their fire, trussed up the chief, and roasted him in the fire while they cooked their dinner.

Or there was the story of Kit Carson who with six companions was traveling one day across the plains of north-eastern New Mexico and ran smack into a village of six hundred Comanche Indians, including two hundred warriors. Carson and his companions slit the throats of their animals and made a fort of the carcasses of their stock. They held off the Indians all day, killing 42, and that night under cover of darkness began a 72 mile forced march to the nearest water. Mountain men were tough, and they had to be. There are no records of sick mountain men. There are records of careless mountain men, who lost their lives to the depredations of Indians.

It was in this hazardous environment that the American Fur Company began to struggle for supremacy at the end of the 1820's. By the mid 30's still more rivals had appeared, intensifying competition for command of the fur trade. No less a figure than Captain Benjamin Bonneville of the United States Army was given a two year leave by President Andrew Jackson to then enter the fur trade. Bonneville ended up building a fort on the upper Green River, a fort that was called Bonneville's Folly. Yet it lay in the heart of the beaver country, and smack astride the principal overland route to the Oregon Country. One wonders whether a strict disciplinarian as Jackson might not have been engaged in a little bit of secret diplomacy or power politics at this point.

Also on the scene by the thirties was Nathaniel Wyeth, who had made a fortune in the New England ice industry, and who now proposed to build a transcontinental trading empire which would embrace trade in salmon and sea otters on the Pacific coast and trade in beavers in the mountains of the West. Wyeth's enterprises failed, but before he was driven from the mountains by a series of broken promises and mishaps, he had established Fort Hall on the Snake River in Idaho, which would soon become a principal resting place for wagon trains bound for Oregon.

From 1833 on, intensifying competition made the quest for profits an increasingly difficult one. Astor was paying up to $9 per beaver pelt, against a previous mountain price of $3.50 for each four pound pelt. One party of Rocky Mountain Fur Company employees had by this time lured a party of Astor's men into a Blackfoot ambush in an attempt to get rid of them. In 1833 the harvest of the Rocky Mountain Fur Company was only fifty-five packs, each containing a hundred pounds of pelts. At prevailing prices this represented a value of perhaps sixty to seventy thousand dollars. In the succeeding years, a combination of over-trapping and fierce competition rapidly drove profits down. The last rendezvous was held in 1839, and was attended by only 120. For some years preachers had been present.

What can be made of this all too brief survey of the far western fur trade? Its end was hastened, no doubt, by a change in fashions from beaver felt hats to silk hats in the 1830's. Astor in one of his periodic trips to Europe had noticed this change, and he promptly sold out to his principal employees just before the roof caved in. But before the roof caved in beaver pelts were used in the making of felt hats and were one of the principal sources of wealth within the Far West. So valuable were felt hats made of this fur that used European hats sold at new hat prices in countries of Spanish America. Thus on one level, the far western fur trade represented a point of intersection between trends of world fashion and frontier enterprise. At another level, it helped to generate the development of big business in the United States.

Notice that the principal trading organizations were large companies--the Hudson's Bay Company, the American Fur Company, and the Rocky Mountain Fur Company. Thus the model of a large company as an effective instrument for the development of frontier economic resources was further confirmed.

The trappers in addition secured a vast fund of geographic knowledge through their explorations. Many of them, after the fur trade died out, became guides for immigrant wagon trains. Paradoxically these men had helped to hasten the end of a country and way of life that they loved. First, by literally mining of the country for its furs, rather than extracting furs at a rate which would allow the animals to reproduce and maintain their populations. Second, by guiding immigrants into the wilderness to transform it further. Not only did their geographic knowledge permit the trappers later to serve as scouts, but many of them provided full reports which could serve as beacon signals to would-be immigrants. Their explorations added both to geographic knowledge and to the incentives drawing people to the West.

Further, as the career of Smith illustrated, many of them provided detailed reports as to the resources of the West. William Goetzmann, in his superb EXPLORATION AND EMPIRE (1966), characterized the American approach to the fur trade under the heading "something more than beaver." His point was that while the Hudson's Bay Company seldom concerned itself with anything beyond the fur trade, Americans were opportunists looking for every sort of chance. They were thus alert to other forms of resources and other possibilities of development and their reports assisted in those developments. But for their reports and explorations, the Oregon Country might ultimately have ended up in English hands. As it was, they were instrumental in drawing settlers to the Oregon Country, where their growing numbers were decisive in assuring American control.

Finally, the fur trade of the West accelerated the erosion of the culture of western Indians. These Indians became increasingly dependent upon European trade goods, as they did so they were reduced to having to serve as trading agents or minor partners of white men. More directly than that, they were rendered more vulnerable to the diseases of white men as well. In 1836 and 1837, unscrupulous whites assisted in the spread of smallpox among the tribes of the upper Missouri. It was during this epidemic that

the Mandan tribe, which still numbered two thousand members before the disease struck, was exterminated.

In sum a story of the far western fur trade is the story that brings together many of the most interesting themes in the development of the American West. That the far western fur trade centered in the regions adjacent to the Uintas in Utah lends additional interest to the Uintas as a field of study, and an environment to which contemporary Americans can come to appreciate something of the challenge that their pioneer forebears met. Indeed it was not far from the northern flank of the Uintas that Jim Bridger settled, building Fort Bridger in the early 1840's. There, his own transformed life suggested the changes to which the fur trade had contributed so much. For years Fort Bridger was a major stopping point on the Oregon and California Trails, and Bridger himself shared information about the West for all who would listen. The story, of course, did not end then. Indeed, the work of exploration itself was incomplete. It remained for others, among them John Wesley Powell, to write the concluding chapters in the story of western exploration, and in doing so to again bring the Uintas to the center of the arena.

LAND POLICY AND LAND ETHIC

by Doug Steeples

A good way to approach the importance of lands and land policy in the definition and development of American society is to consider the circumstances facing western civilization at about the time the New World was discovered. Walter Prescott Webb, in his THE GREAT FRONTIER (1948) argued that the history of western civilization from about 1500 to about 1930 could fruitfully be understood in terms of a great economic boom that accompanied and grew out of the discovery of the New World.

Webb described Europe in 1500 as a civilization that had for centuries known primarily shortages. Goods were in short supply, as society pressed at the limits of resources. Wealth in the form of precious metals was also scarce. Population had been stable or stagnant for centuries, given the inability of society to produce more of the goods required to support life with existing technology.

Faced with shortage, the theorists of medieval Europe had preoccupied themselves primarily with the question of how to distribute what wealth there was. This preoccupation was expressed through the doctrine of the just price--that is, the proposition of the medieval church that those who sold or exchanged goods should charge only a fair price for them. To do otherwise would work a needless hardship on a society burdened with scarcity. In all Europe, then, scarcity obtained; for a population of one hundred million persons, there was a very small surplus of goods, and a supply of monetary gold and silver that reached the sum of only

$200 million. Population, at 26 persons per square mile, pressed at the capacity of the land to support it.

The discovery of the New World radically transformed this situation. The Americas, Africa, Oceania, and other regions which Europeans entered offered wealth of two sorts for European explorers and enterprisers. The first sort Webb characterized as "primary windfalls." These were in the form of goods, human labor, and accummulated treasure or easily accessible precious metals, which could readily be extracted from the overseas territories. These primary windfalls, requiring only a small expenditure of effort and capital by Europeans, amounted to staggering sums, and transformed the economic life of western civilization.

By the year 1600, the amount of gold and silver available to western civilization was 850% higher than it had the century before. By the year 1700, it was just under 2000% higher than in 1500. By 1940, the $200 million dollars of gold and silver available in 1500 had increased to $47.4 billion, or $50 per capita, even allowing for a much greater population. This amounted to a percentage increase in the gross amount of gold and silver available of 24,101. But, by 1940, the population of the New World again stood at a ratio of 26 persons per square mile, the same ratio as in the Old World on the eve of discovery.

The shifting currents of economic thought reflected the changed circumstances that primary windfalls afforded. For a period of two centuries and more, western civilization experienced a relative abundance of precious metal or money, and a continuing scarcity of goods up, that is, to induce inflation, which has been the norm since around the year 1500. Nations that commanded large supplies of gold and silver found that they could purchase the goods they required, so it was natural to regard gold and silver as true wealth.

Economic theory reflected these tendencies with the development of the doctrine known as mercantilism. Mercantilism held that the acquisition of colonies, the development of a large merchant marine to control a country's carrying trade, and an active pursuit of overseas resources would enable the country to become powerful through the accumulation of gold and silver, either directly from mines or indirectly through the sale of colonial produce. Thus provided, a nation could withstand any crisis, purchasing the goods that it required in the midst of war.

By the 19th century, the primary windfalls were largely exhausted, and Europeans turned then to the development of what Webb called "secondary windfalls." These were the produce of the New World that could be made available only through a much greater expenditure of labor--agricultural crops, timber harvest, less valuable mineral resources, fisheries produce, and the like. The effect of the development of secondary windfalls, as populations spread throughout the New World, was to produce a relatively much more rapid rise in the supply of goods than in that of precious metals or money. One result was abundance of goods, as men pursued their own ambitions to develop frontier areas.

It was possible to believe, under the circumstances, that men were engaged in competition as much with the environment rather than with one another. This condition contributed to the popularity in the 19th century of the laissez-faire economic theory--the theory that economy should be unregulated, so as to allow the free interplay of competitive forces to meet the needs of society as they were recorded in the market place. In addition, it was held that goods, not money, represented true wealth.

For our purposes, it is important to emphasize that land was the basis of all of these forms of wealth, and that the productivity of that land was intimately connected with the abundance or scarcity of money and goods, and to the related economic theories.

To illustrate the point further, Webb considered the possible impact of the two voyages of Sir Frances Drake between 1573 and 1578. Drake returned to England with between £300,00 and £1,500,000. Queen Elizabeth's share of his proceeds amounted to 20%. With her share, she was able to pay off the national debt, and invest some £42,000 of profit in the Levant Company, and of that in turn in the East Indian Company in 1600. If the £42,000 that Elizabeth invested were compounded from 1600 to 1930 at 3 1/4 interest, their value would have increased to £4.2 billion, which was a sum equal to the total of British oversees investment in the latter year.

Turning from these general considerations to the question of attitudes towards land in America, and the development of an American land policy and ethic, several points require emphasis.

A number of attitudes contributed toward the formation of a distinctive American view toward the land and wilderness. Of these one of the most important drew upon the Judeo-Christian heritage. That heritage was distinctly mixed in its implications, although it contained some important tendencies. The place of wilderness in Judeo-Christian thought was frequently defined in terms of evil. Wilderness in the Old Testament was the habitation of the serpent; wild, forbidding, the abode of evil. It is significant that in the New Testament Christ was tempted during his forty days in the wilderness. In addition, of course, Genesis I:26-28 enjoined man to go out and subdue the wilderness, and to have dominion over it. This injunction was important in religious terms because it demythologized nature. Trees, rocks, and other natural features were no longer Gods, with whom men tampered at their peril. Instead they were equally the creations of a God who was affirmed to be good. Human energies were thus allowed to play freely upon the natural inheritance.

The requirements of life in a rude frontier, colonial society, emphasized the importance of working to transform and subdue the wilderness further. So did the motives which brought many settlers to the New World, among which were a drive for wealth, or an improved material condition of life. Others extended to what Stewart Udall has defined in his book THE QUIET CRISIS (1963) as the myth of superabundance, the notion that the New World was so extensive and so rich that its resources could never be exhausted.

A final significant ingredient shaping the American response to wilderness and an abundance of land lay in the Jeffersonian ideal of society, to which we have alluded elsewhere. This ideal society was a garden society, halfway between the raw and unsubdued wilderness and the decayed cities of Europe, which were too far removed from nature. The garden, agricultural society which Jefferson idealized retained its roots in the soil. Its members, in retaining such roots, were uniquely close to the goodness that was part of the design of the universe, while at the same time being able to enjoy the fruits of civilization.

Many of the earliest settlers in New England came to the New World for primarily religious motives, and settlement was by congregation or village. Lands were normally granted by provincial governing bodies to a group of applicants who became, in effect, the legal owners or proprietors of a unit of land about six by eight or so miles, called a town or township. The settlers lived in a cluster of houses at one point within the township, and their fields were located beyond. Here the process of settlement was controlled, and even to an extent planned.

In the South, where the communal, religious impulse to settlement was lacking, wealth-seeking settlers staked out claims to land individually, blazing trees to bound the terrain that they claimed, and then recording their claims in provincial land offices.

After achieving independence, it fell to the newly independent government of the United States to develop a land policy. That policy became more necessary after the States which possessed claims to land extending to the Pacific coast under the terms of their colonial grants had forfeited those claims to the Congress of the United States. This cession, which occurred between 1780 and about 1803 created the public domain--that is, a body of land belonging to the people of the United States and managed by their government. In devising a policy for the administration of the public domain, the Congress was guided by colonial precedent and practice, and by the distinctive American attitudes toward land, wilderness and society that we have already encountered.

The organic law concerning the public lands was known as the Land Law or Land Ordinance of 1785. Its effect was to establish a system of surveys, which was to begin on the west bank of the Ohio River near Wheeling, Virginia. These surveys were to progress west along a series of lines known as baselines. At intervals en route to the Pacific coast, north and south running meridians intersected the baselines. In the squares between the baselines and meridians the lands were surveyed into rectangular plots six miles square known as townships, and these in turn were to be divided into smaller, square-mile units called sections, each designated by a number from one to thirty-six in a recurring pattern on the continent.

The Ordinance provided for the orderly sale of lands for the purposes of the federal government, and of one section of land the proceeds from whose sale were to support public education. Sale procedures involved a blending of the New England and southern pattern. Alternate townships were to be sold whole, while the remainder were to be sold in units of one section or one square mile each for the price of $1 an acre, cash. Two years later, as a result of some manipulations of land speculating companies which hoped to lure settlers to their extensive holdings in the West, Congress passed the celebrated Northwest Ordinance of 1787. This law was [illegible] organic statute which provided a framework within which western territories upon achieving a certain level of development might apply for admission to the Union as equal states. These territories were to experience an interim period of development during which they were known officially as territories.

While in the territorial status they were to be governed by a governor, a secretary, and three judges appointed by the Congress. Upon attaining a population of 5,000 adult males, they might elect a single chambered legislature to frame laws, and they might send one non-voting representative to the Congress of the United States. When their total population reached 60,000 they could apply for admission to the Union. These territories, which lay to the north of the Ohio River, were also guaranteed the right of habeas corpus, trial by jury, freedom of conscience, freedom from slavery, and public education.

The Northwest Ordinance created the design by which the process of building states was to march from the Ohio Valley to the Pacific coast. It amounted to the most liberal colonial policy in history, a policy under which colonies would in time become equal partners within the mother country. As the territorial holdings of the United States grew with the passage of time, ordinances resembling the Land Ordinance of 1785 and the Northwest Ordinance of 1787 were extended to cover the new additions. Thus the Land Law became the basic statute for the administration of the public domain, entailing its orderly survey and disposal to private owners, and the Northwest Ordinance the basic statute governing the process of state making. It is important to emphasize, in addition, that these two Ordinances taken together looked toward the achievement of a particular kind of society, Jefferson's ideal society.

At this point, let us digress for a moment, to reflect on the ways in which land policy may shape a society, in order more fully to understand its importance. When it acquired control of the public domain, the Congress of the United States was vested with a tremendous power. Its control of the western lands meant in effect that Americans who wished new opportunities, or who wished to profit from investment in western lands, must look to the national rather than the state governments. The creation of the public domain, then, had the effect of encouraging a transfer of loyalties from the states to the national government. Nor did the story end here. Congress, in adopting this or that policy for the disposal of the public domain, had enormous influence over the shape that American

society really was to take. Should it hold the lands itself and make them available only through rental, one result could have been the creation of a society of people who were dependent on the government, because they looked to it for the land that they rented. Should it distribute ownership of the land among the citizens, Congress had the power to create a society whose members were more independent, because they themselves owned the means of their own support. Again, if Congress turned to a policy of disposing of the lands through a few large grants, then those who received the grants would in effect become an agricultural aristocracy, and the remainder of the population must depend on the aristocrats for their sustenance. If the lands were disposed of in relatively small units, the effect could be to encourage the development of an equalitarian society.

In adopting a system of uniform and orderly surveys, with regularly identified and numbered land units, moreover, Congress assured clarity and certainty of land titles, both of which were necessary preconditions for willing investment in the development of the resources of the country. In Latin America, where surveys and titles were often unclear and uncertain, there was and remains a reluctance on the part of investors to develop the resources that lie within their countries. Thus, from whatever point of view considered, land policy was of fundamental importance in shaping the society, and the policies which Congress adopted were, in turn, a reflection of the prevailing ideals of the larger society. Finally, it should be noted, that in adopting the policies it did, Congress created for the federal government a primary role as a distributor of wealth in the United States. The basic economic function of government was in fact to transmit the ownership of land or wealth to the people of the United States.

During the succeeding century Congress turned over an empire to private ownership. Cash sales of land involved some 300 million acres. Homesteading, by which lands were made available free to those who would develop them, made available a nearly equal amount, grants to the states for disposal for various purposes made available an additional 225 million acres. Lands reserved or used for military purposes involved 95 million acres. Lands granted to railroad corporations as credit basis against which they could borrow money included another 130 million acres, and other laws transmitted to private ownership an additional 35 million acres. In all, something like 1, 131 million acres was transferred from public to private ownership through the 19th century, leaving in possession of the federal government about 360 million acres in the lower 48 states and an equivalent amount in Alaska.

The patterns of legislation by which these lands were translated into private ownership was consistent through the Civil War. So long as American pioneers toiled in the forests of the East, there was a tendency to reduce the size of the unit of land made available for sale, so as finally to arrive at a parcel whose size was such as to permit an ordinary American to purchase and farm it. By 1832, the parcels that the government was marketing were forty acres in extent, about the size that a single family could manage.

When settlement reached the edge of the Great Plains, policy shifted. The Homestead Act of 1862 represented a reverse tendency. The size of the parcel of land available was quadrupled to 160 acres. Instead of selling land, Congress distributed it free of charge to those who would occupy and improve it for periods of five (later three) years. The same Congress by means of the Pacific Railroad Act made extensive grants to railroad companies, whose construction of lines would help to open the new western territories to settlement. Special acts in the late 19th century such as the Timber Culture Act, the Timber and Stone Act, and the Desert Land Act made additional parcels available to settlers on very liberal terms, as further inducement toward the occupation of the lands of the arid and semi-arid West. The lower productivity of such lands, given a shortage of precipitation, compelled more liberal sales, grants, sizes of parcels.

In the late 19th century, this prodigal give-away policy was finally reversed, as attitudes began to shift amid a growing recognition that the physical circumstances of the United States had altered substantially. By the 1890's it was apparent that American resources were not limitless. The once rich gold fields of California were no longer productive. Already something like half of the original forest cover of the nation had been stripped away, and streams that had once flowed clear now carried immense loads of silt and debris to the sea.

John Wesley Powell's 1878 report on the lands in arid regions of the West (treated below) substituted for the myth of superabundance the notion that the West was fundamentally a region of scarcity, and that that scarcity was of the one essential resource--water. Facing that condition would refer a radical reorientation of settlement techniques and public policy.

Meanwhile, the United States Forestry Association had come into existence in 1875. It began to argue the need to conserve timber resources and manage them for long range sustained yield, manage them as crops, and farm them. Further, there was evidence that rain, contrary to popular hopes, did not follow the plow. There might be cycles of wet and dry years, but the condition of drought was to remain normal in the Far West.

In addition, there was some indication that attitudes towards the wilderness itself were beginning to shift. Henry David Thoreau in the early 19th century had published WALDEN, a romantic essay on the values of living close to the land. However, Thoreau himself favored a gentle countryside and was panic-stricken when he climbed Mt. Katadin in a storm: wilderness was still an ambivalent image.

John Muir, Wisconsin born and educated, after injuring an eye in a bicycle factory in Indianapolis had hiked to New Orleans and then traveled to California. For the balance of his life he wrote articles describing and emphasizing the need to preserve the wild resources of the Far West, notably the Great Sierra Nevada of California, which he described as the Range of Light. Muir, in short, began to develop an ethic of preservation, to stand along

side the foresters' ethic of conservation. Muir's ethic pointed to the need to preserve unchanged certain natural areas, to be regarded as base data for comparison in studying the effects of man on the environment.

Conservationists, on the other hand, thought in terms of a wise management and efficient use of resources, rather than locking them up altogether. The final chapter in this brief survey of changing attitudes about resources began with the announcement of the Superintendent of the Census in 1890 that the frontier was closed. Thus disappeared a fundamental fact of the American experience: the once limitless free land, the once limitless West was now gone. By the time this announcement was rendered, preservationists had already secured the reservation of the first national park, Yellowstone, in 1872. Sequoia National Park was established in 1890 and Crater Lake National Park in 1902.

The national parks were only one indication of the change in attitudes. An amendment to a law known as the General Revision Act of 1891 allowed the President of the United States by executive proclamation to preclude lands in the public domain from settlement. This amendment was the effective basis for the creation of a system of forest reserves which later became the national forests, to be managed along the principles that conservationists advanced. In 1894 Congress passed an act known as the Carey Act which reserved for the construction of dams and irrigation works a portion of the proceeds from the sale of public lands in 17 western states. In 1902 Congress passed the Newlands Act, broadening the reclamation program by reserving all of the proceeds from land sales in those western states for the construction of dams and irrigation works. Thus by the beginning of the 20th century a body of legislation made the government a conserver of natural areas rather than a distributor of them.

The 20th century was to see an elaborate bureaucracy and range of public environmental activities develop. Under President Theodore Roosevelt the Reclamation Bureau began the first of its comprehensive programs which were subsequently to fill the West with gigantic dams and irrigation projects. In the 1920's multi-purpose, federally constructed dams came into existence with the passage of the law authorizing the construction of Boulder Dam for purposes of flood control, the manufacture of electrical power, and the conservation of water for irrigation and recreational purposes. The national forests by the mid 20th century were to embrace something over 150 million acres.

By that time, too, an executive order of President Franklin Roosevelt in 1935 had closed to occupation the remaining federal lands that lay outside the national forests. These lands were to be administered by the Bureau of Land Management as grazing and other types of lands. In both the case of the national forest and the land under the jurisdiction of the BLM, the principles of multiple use and sustained yield obtained.

These principles were elaborated by the first chief forester of the United States Gifford Pinchot. They rested on the premise that public purposes should outweigh private profit. A new government role of redistributed wealth came with the welfare state. Even so problems remained which we still face today. Among these was the primary consideration that in awarding uses for any particular piece of the public domain, foresters and agents of the BLM were to assign primary importance to the primary local user. This meant in the case of forests that timber companies should be given primary consideration. It meant in the case of range lands that stockmen should be given first grabs. Thus the principle of multiple use could be honored as often in the breach as in fact.

Standing beside the lands of the BLM and the national forests were those of the national parks, altogether an additional 14 odd million acres. Under the terms of the National Parks Act of 1916 these lands were to be reserved "unimpaired" for the benefit and enjoyment of future generations of Americans. The Act itself was passed in the aftermath of a great struggle to keep the city of San Francisco from constructing a reservoir in the heart of Yosemite National Park. That struggle was unsuccessful, and the failure of preservationists to protect the Grand Canyon to the Tuolumne River in Yosemite Park was the immediate spark for the passage of the law. There have been subsequent attempts on the national parks as well, most recently extending to proposals to build two dams that would affect Grand Canyon National Park. There are in addition proposals to construct as many as five dozen reservoirs within Kings Canyon National Park. The moral is that the dam builders need only an opening in order to extend themselves into the most precious reserves of the national park system.

Students who participate on the Wilderness Program will be traveling through lands administered by one or another of the federal agencies described here. For the most part the lands through which they travel are designated primitive or wilderness areas. These designations originated by administrative order within the Forestry Service in 1931, when through the activties of Aldo Leopold and Bob Marshall the Gila Wilderness was created in Arizona. In 1964, after a nine-year struggle, Congress passed the Wilderness Act, which gave statutory bases to the wilderness areas. This law required that within a period of ten years all lands belonging to the federal government that were undeveloped and did not show substantial human impact should be surveyed to determine suitability for inclusion within a national wilderness preservation system. Areas smaller than 5,000 acres were to be called wild areas, the between 5,000 and 100 thousand acres primitive areas, and those in excess of 100 thousand acres wilderness areas. No motorized vehicles were to be allowed in wilderness areas, although mining activities could be pursued there until 1984.

The creation of wilderness systems represented a partial triumph of the preservationist ethic, the ethic that moved John Muir, and that began to grip urbanizing Americans around the turn of the century. The Boy Scouts were in their inception a reflection of the popularity of this ethic, having come into existence in this country about the time of World War I, when many people, concerned with the loss of the frontier, yearned for a way to preserve something of the pioneer life and the character traits that it was believed to encourage. An excellent discussion is in Roderick B. Nash, WILDERNESS, AND THE AMERICAN MIND (1967).

The tale is not yet ended. The process of review of lands for inclusion in the wilderness system is far from complete, and far behind schedule. The National Park Service, in particular, has lagged. The Forest Service, while less lax in its review, has tended to reserve only those areas that lie near or above timber line, and where commercially valuable stands of timber are not to be found. Thus the possibility remains that the wilderness system will include some of the least interesting, as well as some of the most scenic wild areas left in the United States, and be surrounded by logged over zones.

There is a further possibility that the whole system will be scrapped. One of the provisions of the Wilderness Act was that a Commission would be established to review all of the land laws of the United States. That Commission, known as the United States Public Land Law Review Commission, offered its report in 1971, and that report reflected the old frontier ethic which held that government should get rid of its lands, including perhaps even the national parks. It was a report that pointed towards use, indeed towards using up wild resources, even to the extent of allowing open pit mining within the national parks.

Legislative proposals are currently extant which would give effect to the recommendations of the Commission. Students who participate in the Wilderness Program should be aware of these proposals, and, one hopes, sufficiently impressed with the importance of both conservation and preservation to become alert and informed citizens who attempt to shape the legislative process itself. Behind the current debate over the fate of the public lands and the wilderness system, of course, lies a larger collision of value systems. Simply put, the collision is between the old exploitative ethic of the frontiersmen, who asserted that resources were limitless and it was the function of the government to distribute them and encourage their development, and the conservationist and preservationist ethic, which argued that instead resources were finite and that their management should be bent to the long-term purposes of society. That debate is only one dimension of a larger debate about the nature and purposes of American society itself. In that sense it is but a chapter in a drama that is still going on.

THE IMPORTANCE OF WILDERNESS IN AMERICAN LIFE

Douglas Steeples, ed. by Phil Shore

At some point each brigade or expedition should consider some of the values and influences of wilderness on man. This discussion might arise naturally out of the situation in which the group finds itself. A particularly good time, if conditions allow, might be just before solo.

The most obvious value of wilderness, given our present undertaking, is for recreation. It affords a chance for industrial, urban, 20th century people to leave behind the many daily distractions of our civilization and live in a setting where attention is on the elementary things of life: food, shelter, safety, and companionship. One can rely only upon the immediate group. International affairs, appointments, even the clock, may slip away as of little importance. This use of wilderness can provide refreshment of spirit, physical challenges, and a setting for confronting elemental nature without all the props of our ordinary lives. All of these are valid uses of wilderness.

Students will probably realize that there are other values. They are likely to realize that areas in which the role of man is minimal are of value to science. In wilderness areas natural processes can be observed at work, undistrubed by man. They can provide a guage against which to measure change. They provide a haven for wildlife, especially for the larger animals, where they can live out their lives at least relatively unhampered by man. They provide a place where the natural diversity of life can continue, whereas in the cultivated areas a few plants, and therefore animals also, are preponderant. This not only allows the many species to continue for their own sake, but ensures the continuation of a large and diverse gene pool from which new forms of life may evolve.

An aspect of wilderness which students are less likely to perceive is its role in the shaping of America and Americans. Perhaps the most notable concept of the role of wilderness in American life was that put forth by Frederick Jackson Turner in his essay on "The importance of the frontier in American history," first published in 1893. This was only three years after the director of the Census Bureau declared that the frontier was closed. This fact caused uneasiness and uncertainty, and the feeling that things would no longer be the same as they had been for the past 300 years.

Turner suggested that the unoccupied lands were the key to understanding American democracy, individualism, cooperation, inventiveness, and most of the other distinctive traits of the American character.

The idea of progress, or the linear development of history as opposed to a cyclical view, is not distinctively American, but it has flourished here as in few other places. The frontier was a powerful force in that flourishing. In frontier areas one could

see civilization advancing year by year as the wilderness receded and man visably conquered nature - or so it seemed.

Much earlier the existence of the open lands - wilderness - was crucial in Jefferson's concept of a nation of independent land-owning farmers. There is a considerable elaboration of this in the section of the manual on land policy. In the 19th century as Americans were trying to create a national identity, they turned to the landscape for inspiration. In essence they said that we may not have the history and traditions of western Europe, but we do have a continent full of natural glory which surpasses that of Europe. By extension it was assumed that man would reach new heights of glory here also. One manifestation of this was the painting of the Hudson Valley school which may strike us as hopelessly romantic, but which tells us much about the attitude of the people toward the wilderness.

One final effect of wilderness on the American character which should be noted is what has been called cultural regression. One of the clearest examples of this is the law profession. In England there were barristers, attorneys, solicitors, and notaries public, each with clearly defined duties. A frontier settlement could hardly afford such specialization. Instead we developed a sort of general practitioner who did all things in the legal line. This phenomenon occurred in many professions and was even evident on the less exalted levels of society. A homesteader might be a land owner, but he was also likely to be his own carpenter, blacksmith, doctor, gardener, as well as farmer or cattleman. Such extremes disappeared as quickly as the density of settlement allowed the maintenance of blacksmiths and doctors, for example, but even today our culture encourages and respects a person who is able to perform a great variety of tasks. Witness the do-it-yourself movement. Pre-term instructing might even be considered a variety of cultural regression!

There is another level of cultural regression. It could be a liberating force. The general practitioners had few traditions or theories and could, therefore, look with a vision unencumbered. One of the best examples of this is John Wesley Powell.

Powell did not have a full formal education, but a lively interest in many things led him to educate himself. A childhood friend in Jackson, Ohio, stimulated his interest in science. He did not find a college which could teach him sufficient science, so he trained himself. After teaching briefly in Illinois and becoming head of the state Natural History Society, he served in the Civil War, and lost an arm at Shiloh. He returned to teaching after the war. The normal classroom was too tame though, so he managed to run what we would call a field trip to Colorado one summer.

One thing led to another, culminating two years later (1869) in his celebrated trip down the Green and Colorado Rivers, from Wyoming through the Grand Canyon. This prompted Congress to establish the

the Geographical and Geological Survey of the Rocky Mountain Region, with Powell in charge.

During this study his interest in the ethnology of the Indians was aroused. The survey itself described the major geographic regions of the western United States and identified the characteristic land forms of each. In the process Powell in effect invented the science of geomorphology (the form of the land). He later became head of the recently formed United States Geological Survey and for 15 years was the guiding force of that highly respected agency.

As if exploring and describing the mountain regions of the western United States, founding a new science of geomorphology, and running a government agency were not enough, his researches in the west led him to think in terms of environmental classification for determining settlement patterns, and to make major contributions to the anthropology of the American Indian.

Powell was clearly an unusual man. In addition, he worked in a geographical area where the geological record is unusually clear. There is not a lot of biology covering up the geology. This encourages geologic observations. Also, the spectacular canyons and mountains naturally bring to mind the question of "why did this happen?" Cultural regression, by leaving his mind open to observe the evidence and then organize it, helped him to understand some things he saw when others more highly trained might not have.

If Wilderness has had such profound effects on our culture in the past, are we justified in feeling that it might have other effects in the future? If it led Powell to ask new questions, might it not lead others to ask other new questions in the future? Do these chances make it worth our preserving some areas of true wilderness? How much are we willing to give up (e.g. oil, timber, minerals) to maintain wilderness? What is the meaning and value of wilderness to each of us as individuals? These are some of the questions which can be posed to the students. More on the place of wilderness today is in the section of the manual on land ethic.

PART III

Logistics

Outfitting Organization

Preparation and organization are both crucial to a proper outfitting process. Instructors should be on campus several days in advance of outfitting day to get things in final order. At this time first aid kits should be packed, map sets made up, spice kits filled, sample food bags made, etc. Also, if there is time, it would save time and confusion to bag all the resupply rations and pack them away. All of these things greatly increase the efficiency and speed of the actual outfitting day.

On outfitting day instructors should be on campus several hours before students are scheduled to arrive in order to prepare the food and equipment stations. Each patrol or brigade instructor should stake out his/her separate area and supply it with all the common group equipment he/she will need. This way you can hand out personal and tarp group equipment such as billy cans, ponchos, slings and carabiners, etc. as students arrive. Also, there should be several stations set up with other equipment that needs to be fitted individually. Sleeping bags and packs would fall into this category. Meanwhile the food can be set out in a row in front of Bundy Hall with plenty of plastic bags available and with sample food bags of the right size next to each food. The water program does their bagging on one side of the line of food and the mountain program uses the other.

As students get all their personal gear, they can be sent over to help with the bagging. An instructor needs to be posted in this area to supervise the bagging process. Once bagging is completed and equipment has been issued, food can be distributed to individuals. This is best done one brigade or patrol at a time with one member of each cook group filling a large stuff sack as an instructor lists off the number of bags of each food item to be taken. That completes the equipment and food check in.

In case of rain, the entire operation may be moved into the Fieldhouse. Depending on what stage the outfitting is in, it might be moved to various outside porches like Barrett or Dennis or into classrooms in Tyler. However, for the sake of efficiency and centralization it probably is wisest to move to the Fieldhouse.

If this process is done well, outfitting should be completed before dinner and the evening can be spent packing, talking, and in various other activities as desired.

OUTFITTING DAY

The principal tasks of this day are to assure that students are properly enrolled in the program, that all fees have been paid, and then that they are provided with program equipment that is in sound condition. Their questions and those of their parents should be answered. A careful examination of the personal items that students bring is most important. Such an examination not only assures that students will have adequate personal gear, but provides instructors with a teaching opportunity as well. Some students will bring items that are either inappropriate or of inadequate design for rugged wilderness use. Many will also bring items that can only be considered to be luxuries. Instructors when confronted with such items ought to ask the students to decide what they think they really ought to take into the wilderness with them, so as to give them the responsibility as far as possible for evaluating their own personal gear. Instructors may assist in this evaluation by posing pointed questions as needed.

It is particularly important that students learn from the beginning that we have selected and purchased not only good equipment but in some cases specialized equipment for program use. We expect equipment to be used for the purposes for which it was designed. For example, ground cloths as ground cloths and ponchos as ponchos. Ponchos are not to be used a s ground cloths. Instructors will also want to show students something of the variety of adjustments that are possible for their packs, sleeping bags, and other equipment. We have learned in the first years of the program, for example, that students have not learned that the leather slides on the sleeping bag drawstrings are in fact slides, and that it is unnecessary to knot the drawstrings.

Examination of students personal equipment should also occur on outfitting day. Boot fitting is critically important. When a student has removed his stockings it should be possible for him to stand in his bare feet inside his boots and for an instructor to insert his hand behind the student's heel inside each boot and touch the sole of the heel of the boot. Properly fitted boots, when put on over two pairs of socks and properly laced and tied, should fit so that when a student kicks a concrete wall he does not hurt his toes; his toes ought not jam against the end of the boot when the boot is tied under these circumstances. Other equipment should also be checked carefully. Clothing should be warm enough for cold weather, etc.

There should be time after the evening meeting on outfitting day to provide demonstrations and discussion of general interest. Instructors may wish to use the evening time to familiarize students with particular items of equipment that they also be acquainted with the threefold conservation intent of the program--conservation of personnel, of equipment, and of the environment, so that students from the outset begin to consider conservation to be a way of life.

PERSONAL CLOTHING AND EQUIPMENT

The technique of dressing for comfort and safety is one of the important teachings of the Wilderness program. A large percentage of outdoor tragedies can be traced directly or indirectly to ignorance of this technique. All clothing for wilderness purposes must be very roomy to allow freedom of movement and aeration.

There is no substitute for wool, which is the only material which can provide adequate heat retention even when wet. Where wool is specified on the clothing list, BRING WOOL. Where moderate to heavy weight woolen garments are mentioned, we mean moderate to heavy, NOT LIGHT. On September 1, 1973, our mountain expedition experienced a 16 inch snowfall, while camped above 11,000 feet. In 1974 our water expeditions experienced 12 days of rain in a row. Be prepared for cold and/or wet weather.

You will note in the following list that the mountain expeditions are expected to have at least three layers of wool clothing for the trunk of the body. If you are uncertain whether that will be enough or are "cold blooded", bring four layers.

Search your attic or basement for old materials, especially wool pants and sweaters, felt hats, wool stocking hats, wool socks etc. Salvation Army, Good Will, rummage, surplus and other such stores are good sources of wool clothing at bargain prices.

MOUNTAIN PROGRAM CLOTHING LIST

1. BOOTS, MOUNTAIN 1 pair

   You must have a pair soled with lugged vibram. We recommend boots with steel shanks and narrow welts. Boots should be fitted with one pair of heavy wool socks worn over one pair of light wool socks, just as you will wear them in the field. Wool socks are imperative for their "wicking" action, which conveys perspiration away from your feet. Boots should be large enough so that, when you put your feet in them bare you will be able to run your hand down the inside of the unlaced boots and touch the sole behind your heel with one finger thickness between boot heel and your heel. Laced tight with socks on, the boots should fit so that when you kick a cement curb moderately hard your toes do not jam against or touch the boot toe. If boots are too tight your feet will become very cold in snow because of restricted circulation and air insulation. If too loose, your feet can slip around inside them when you are climbing, or develop blisters from friction in hiking.

2. SOCKS, WOOL 3 sets (6 pairs), 1 hightop.

   Cotton socks are not permissable. 85% wool-15% synthetic preferred. 100% wool o.k. You will wear two pairs of socks at a time. Have, if possible, Norwegian ragg outer socks and light athletic inner socks, both types of wool.

3. PANTS, WOOL 1 pair

Have them roomy in the seat and waist and do not have cuffs. Moderate to heavy weight.

4. UNDERWEAR PANTS (LONG WOOL) AND UNDERWEAR UPPER (WOOL) 1 set

Check surplus stores for Army-Navy type. Sears has them, see the winter catalog. No substitutes for wool, although if you can't find all wool a 50-50 cotton wool mix is o.k. NO THERMAL COTTON OR SYNTHETICS.

5. SHIRT, WOOL 1 needed

Remember it must be wool, moderate to heavy weight, and it must be extra large for you to allow underclothes ventilation, and freedom of movement.

6. SWEATER, WOOL 1

Crew or turtle neck best; moderate to heavy weight.

7. HAT, WOOL 1

100% wool knit "stocking hat."

8. HAT, FELT 1

Any old wide brim felt hat will do, but check for correct size.

9. MITTENS, WOOL 1 pair

Bring a pair of 100% wool mittens. Wool gloves acceptable.

10. GLOVES, CANVAS 1 pair

Canvas or cotton gloves. Goat skin OK.

11. PANTS - SHORTS

Bring an old pair of shorts for hiking and camping on warm days. No levis.

12. T-SHIRT

Cotton T-shirt or light cotton shirt.

13. SWIMSUIT - Nylon

Nylon is light weight and dries quickly.

14. SUNGLASSES 1 pair

Students who regularly wear glasses must have dark clamp-ons for regular glasses or have dark glasses which are especially ground for your prescription. You must have these and be sure that they fit properly before coming. Be sure you have a strong case for them, metal preferred.

15. KNIFE, POCKET 1

Bring a small pocket knife. Hunting knives in scabbard not permissable.

16. UTENSILS, EATING 1 SIERRA CUP

17. CANTEEN 1

18. BELT

Bring your own. But be sure it is at least 3 inches longer than you would normally wear. Web belts are O.K.

19. SHORTS, COTTON 2 pair

Boxer type preferred, for both sexes, to prevent chafing by wool trousers. Girls, nylon underwear that will wash easily and dry easily may be worn under cotton boxer shorts.

20. PERSONAL, TOILET, VARIOUS

Use your own judgment: Such things as

(a) Razor and blades, if needed
(b) Toothbrush, small (cut 1/2 the handle off a regular brush)
(c) Toothpaste or powder, small (or use salt)
(d) Comb, pocket, small
(e) Hankerchiefs, 2 large, colored
(f) Towels: 2 small hand size-diapers are best, absorb and dry quickly
(g) Sanitary napkins or tampons - bring enough for your needs
(h) Nail clippers (useful in first aid, fishing, and hygiene)
(i) Compact sewing kit. We recommend a spool of nylon carpet thread. Put tape across each end of the spool with needles inside. Be sure thread will go through eye of needle you bring.

21. SKIN PROTECTION, VARIOUS

You will need such things as:

(a) Chap stick (Glacier cream recommended)
(b) Hand cream, no glass bottles allowed
(c) Suntan lotion or sun screen
(d) White's A & D Ointment may replace (a) -- is fine for burns, general

22. SNEAKERS (TENNIS SHOES) 1 pair

Bring a very light pair. Must fit with 1 pair of wool socks. Do not bring heavy gym shoes.

23. CAMERA optional

Consider weight. Bring enough film with you. No opportunity to receive film while in the field.

24. REPELLENT, INSECT

Bring your favorite -- you will use it!

WATER PROGRAM CLOTHING LIST

1. UNDERWEAR 2 pair

2. SHIRT: COTTON 1

T-shirt or long-sleeved turtleneck if you prefer (for warmth)

3. SHIRT: LONG-SLEEVED COTTON (BUTTON UP FRONT STYLE) FOR SUN PROTECTION - 1

Surplus stores, or work clothes, a good source for this type of shirt.

4. HEAVY SHIRT (OR SWEATER), WOOL, LONG-SLEEVED - 1

Worn for warmth over other clothing. Remember it must be wool and it must be extra large for you to allow underclothes, ventilation, and freedom of movement. SWEATSHIRTS ARE NOT ACCEPTABLE: HEAVY, BULKY, COLD.

5. PANTS, COTTON OR SYNTHETIC 1 pair

Tan or green work pants (or army surplus equivalent). Tapered legs restrict movement and blue jeans stay wet forever-- BOTH ARE UNACCEPTABLE.

6. PANTS, SHORTS 1 pair

Sport shorts or acceptable cut-offs (not denim)

7. SOCKS 4-6 pairs

Athletic or sweat socks: 2 pairs must be wool. You may prefer one pair long enough to tuck pants into.

8. FOOTWEAR: ONE OF THESE COMBINATIONS

Remember, while making your decision, that while our primary mode of transportation will be the canoe there will be several activities which will require hiking: portages, with the pack or canoe on your shoulders, may be over a dry, rocky streambed or over a steep hill through forest undergrowth or through a beaver swamp. We will also be teaching technical rock climbing and overland map and compass work.

EITHER: 2 pair canvas high-topped sneakers (if you have strong ankles and tough feet)

A note on sneakers: they should be of good quality and must be high-topped (tennis shoes or other low-cuts are unacceptable).

A note on the boots: a pair of inexpensive work boots or stronger canvas shoe is recommended for people who want extra ankle support. Girls may have to buy boys' or men's sizes. We recommend inexpensive because they will get soaked often and may be damaged by wetness by the end of the trip. Another possibility is to check surplus stores for "jungle boots." These are Army issue for Vietnam: canvas uppers, leather lowers and hard rubber soles. Used, they cost $5-7, new perhaps $14-16.

9. SWIMSUIT, NYLON 1

   Nylon is necessary because it's light and fast drying.

10. HANDKERCHIEFS, LARGE COLORED BANDANA STYLE 2

11. HAT, WITH BRIM 1

    An old, collapsable felt or cotton hat for sun protection, perhaps you can find one around your house.

12. HAT, WOOL 1

    Wool knit stocking cap for those cool Canadian nights.

13. KNIFE, POCKET 1

    Choose a small two-blade type or small sheath knife.

14. UTENSILS, EATING: 1 SIERRA CUP

15. CANTEEN 1

    The lightest and cheapest canteen is a empty, plastic, liquid detergent bottle. Aluminum screw-top containers are good if you wish to purchase one.

16. SUNGLASSES: 1 PAIR WITH STRONG CASE IF POSSIBLE

    These are necessary for sun protection.

17. SKIN PROTECTION, VARIOUS: ALL NECESSARY

    You must bring:

    (a) Chap stick
    (b) Hand cream
    (c) Sun tan lotion may be combined

18. REPELLENT, INSECT: NECESSARY

Bring a good supply, (1-2 small plastic bottles). Dr. Cutters, Woodsman, or Off work better than 6-12.
ALL CONTAINERS SHOULD BE WATERPROOF AND NON-DESTRUCTIBLE: THEY WILL BE BENT, JABBED, SAT, AND STEPPED UPON. NO GLASS SPRAY CANS OF ANY KIND. PUT THINGS IN RE-USABLE PLASTIC BOTTLES OR SMALL METAL TINS.

19. PERSONAL, TOILET, VARIOUS:

Use your own judgment. Such things as:

(a) Razor and blades, if needed (usually unnecessary in wilderness)
(b) Toothbrush, small
(c) Toothpaste or powder, small
(d) Comb, pocket, small
(e) Towel, cotton dishtowel type (not terrycloth)
(f) Sanitary napkins or tampax--bring enough for your needs
(g) Compact sewing kit (recommend spool of nylon carpet thread. Put a piece of tape across each end of spool with needles inside. Make sure thread will go through eye of needle you bring.)

20. ANY MEDICATIONS

Packed in waterproof plastic bottles or containers. All must have labels and prescriptions included for our knowledge and for customs officials.

21. CLOTHING, MISCELLANEOUS OPTIONAL

BELT, PANTS: Web or plain leather type O.K.
GLOVES, COTTON: One pair of light work gloves to avoid paddle blisters.
PADDLES: If you already own a favorite.
Light thin shell windbreaker (not a jacket).

22. CAMERA, OPTIONAL

Consider weight and waterproofing. Bring enough film with you. No opportunity to receive film while on expedition.

CARAVAN TRAVEL INSTRUCTION: MT. PROGRAM

1. Before departure there will be, in each vehicle:

a. A list of all vehicles in the caravan, with descriptions of each, license plate and serial numbers, and names of drivers of each.
b. In writing, a pre-agreed order in which vehicles are to drive.
c. An itinerary, as below, for the journey, in writing.

2. Itinerary--WESTBOUND

a. First day's trip west, depart EC not later than 8:00, to travel to TONGANOXIE STATE PARK, Kansas. Vehicles to gas up in Lawrence or thereabouts as group sets up camp for evening. Alternate camp: Lawrence, KOA.

Check points--at which caravan will halt until all vehicles have arrived:
(1) Intersection of US 41 and I-70, Terre Haute
(2) Lunch stop, Pocahontas, Illinois
(3) I-70 just beyond off-ramp at Danville, Missouri.

b. Second day's trip, depart not later than 7:00 a.m., proceed to COLD SPRINGS CAMPGROUND, near Black Hawk/Central City, Colorado.

NOTE: THERE IS NO WATER AT COLD SPRINGS CG: VEHICLES MUST OBTAIN NEEDED WATER IN 5-GALLON CONTAINERS EITHER AT GAS STOP AT DENVER OR IN BLACK HAWK.

Check points:
(1) Texaco station near US 81 and I-70 junction at Salina, Kansas
(2) Lunch, Colby, Kansas, municipal park
(3) Limon, Colorado, Dairy Queen

c. Third day's trip, depart 7:00 a.m., arrive Vernal, Utah between 2:00 and 3:30 p.m.

Check points:
(1) Fraser, Colorado (gas)
(2) Craig, Colorado - lunch, park
(3) Vernal city hall parking lot

AFTER MOVING GEAR TO DIVIDE CARAVAN, obtaining fishing licenses, buying margarine and cheese, the units will move out to the north slope or to Moon Lake to camp for night.

3. Itinerary-EASTBOUND

a. First day, caravan departs road heads to meet in Vernal City Hall parking lot by noon, eat lunch and get gas here. Destination--Meadows National Forest campground east of Steamboat Springs, Colorado

Check Points:
(1) Steamboat Springs Health Spa------showers and gas
(2) The Meadows National Forest campground on Rabbit Ears Pass where camp will be made.

b. Second day's trip: depart Meadows campground in early morning, proceed to Wilson State Lake reservoir in Kansas.

Check points:

(1) Fuel Fraser, Colorado
(2) Fuel and lunch in Limon, Colorado
(3) Fuel Oakley, Kansas.

c. Third day's trip: depart Wilson Lake approximately 7:00 a.m., proceed to Graham Cave Park west of St. Louis.

Check points:

(1) Fuel, Salina
(2) Lunch, and fuel, Independence, Missouri
(3) Fuel, Columbia

d. Fourth Day: travel from Graham Cave to Earlham College. Arrive about 2:30-3:00 p.m.

Check points:

(1) Fuel at Effingham, Illinois
(2) Lunch at Marshall, Illinois
(3) Bundy Hall

WATER PROGRAM CARAVAN PROCEDURES

I. Driving in caravan:

A. Before departure there will be in each vehicle a list of all vehicles in the caravan, with descriptions of each license plate and serial numbers, and names of drivers of each.
B. Lead vehicle, with most reliable speedometer, responsible for pace. Cruising speed approximately 55 m.p.h. Ideally this would be a vehicle without a canoe trailer but this is not always possible.
C. Drivers should try to maintain visual contact with vehicle in front but should be careful not to follow too closely and not to lose sensitivity to traffic overtaking their vehicle.
D. Signals used in driving to communicate with other vehicles in caravan:
   1. STOP: Headlights and emergency flashers on.
   2. SLOW DOWN: Headlights on.
   3. 1/4 tank of gas left in my vehicle: Driver gestures with left hand out window of vehicle pointing down.
      a. Acknowledge receipt of this signal by brief use of emergency flashers.
      b. Driver of next vehicle passes this signal on to lead car, who also acknowledges receipt of signal with emergency flashers.

IN CASE OF ACCIDENT:

1. Contact State Police immediately.
2. Call person designated as Wilderness Program contact in Richmond
3. Do NOT identify self to switchboard operator or give operator any information.

II. Indiana to Ontario: Trip [illegible].

A. First Day:

1. Leave Earlham Campus, Richmond, between 7:30-8:00 a.m. at latest.
2. Follow NW 5th Street to Williamsburg Pike. Proceed north on Williamsburg Pike to I-70.
3. Proceed west on I-70 to I-465 North around Indianapolis to I-65.
4. Proceed north on I-65. Stop and buy lunch in Rennselear, Indiana (exit from I-65 on Ind. 114).
5. Checkpoint and lunch stop at rest area about 20-22 miles north of Rennselear on I-65.
6. After lunch continue north on I-65 to junction with I-80 and I-94.
7. Proceed west on I-80 and 94. This route becomes Tri-State Tollway, I-294.
8. Follow I-294 north around Chicago to I-90 (also posted as Northwest Tollway).
9. Proceed north on I-90 (Northwest Tollway) towards Beloit, Wisconsin. Just before Illinois-Wisconsin border Northwest Tollway ends. The route continues and is posted as I-90.
10. Checkpoint at rest area just over Wisconsin border east of Beloit, Wisconsin.
11. Continue following I-90 north. I-94 joins with it near Madison, Wisconsin. For the rest of day follow I-94 northwest (I-90 separates from I-94 near Tomah, Wis.).
12. Camp first night at Black River State Forest (exit from I-94 at Millaron, Wisconsin), signs direct way to campground.
13. Mileage for first day approximately 540.

B. Second Day:

1. Leave Black River State Forest early. Return to I-94 and follow it NW to Wisconsin-Minnesota border (St. Croix R. is border). At border I-94 becomes US 12. Proceed on US 12 for 20 miles to junction with I-694 around Minneapolis-St. Paul.
2. Follow I-694 north to junction with I-35E. Take I-35E north toward Duluth. This route becomes I-35 about 14 miles north of I-694.
3. Checkpoint and lunch stop at Hinckley State Monument, Hinckley, Minnesota. Stop and buy lunch in Hinckley, before proceeding to monument.

4. After lunch return to I-35 and continue to follow it north until exit for Minnesota 33 (towards Cloquet, not Duluth).
5. Follow Minnesota 33 north until junction with US 53. Proceed north on US 53 to Cook, Minnesota. Follow signs at Cook for Wakemup Campground in Kabetogama State Forest for second night's campground.
6. Mileage for second day approximately 465.

C. Third day:

1. Leave Wakemup Campground early. Return to US 53 and continue following it north towards International Falls.
2. Checkpoint at Eriosburg, Minnesota
3. All vehicles proceed together. After crossing bridge to Canada, will be stopped by Canadian Customs Officials.
   (a) Customs Officials may do a fairly thorough search of a few randomly selected packs. Two items will expedite their search and questioning:
      1. All prescription medicines carried on trip should include a copy of prescription in container so time is not wasted while officials check with a pharmacist.
      2. Have a list of the contents of all first aid kits and have a faculty kit available for inspection.
   (b) After Customs officials are satisfied declare the amount of food and its value and pay the assessed duty.
4. After Customs proceed to Department of Lands and Forests, 922 Scott Street, in Ft. Frances, to purchase fishing licenses.
   (a) The licenses should be ready to be picked up. One instructor should go in and get them, and make any financial adjustments needed due to dollar conversion charges.
   (b) While fishing licenses are being purchased some staff purchase lunch materials. Eat lunch in Ft. St. Pierre Park, on east side of Ft. Frances.
5. After lunch proceed to put-in site to be determined by each year's staff.

III. Canada to Indiana: Trip back.

Depending on time of take out, the following is a possible scenario.

A. First day:

1. Checkpoint at Ft. St. Pierre Park in Ft. Frances at prearranged time. Brigades will come from take-out sites on their own timetable.
2. After rendezvous proceed across bridge to U.S. Customs.

(a) They will ask for identification of everybody, and for passports or visas for any non-citizens. When in doubt it is safer to take along a person's papers. The information sheet compiled for fishing licenses is a help in arranging this.
(b) The official may do a random search but once convinced the group has been canoeing (mostly by the small I think) he becomes less thorough.

3. Follow US 53 south from International Falls to Cook. Follow signs to Wakemup campground.

B. Second day:

1. Leave Wakemup early, return to US 53 and continue following it south to junction with Minnesota 33.
2. Proceed south on Minnesota 33 to junction with I-35.
3. Follow I-35 south. Checkpoint, and convenient rest stop is the first rest area, about 20 miles south on I-35.
4. Return to I-35 and follow it to I-35E. Proceed on this to I-694.
5. At a convenient time, about Wyoming or Forest Lake, buy lunch food. Most of these small towns have a municipal park of some sort where you could eat. There may not be any water available.
6. Follow I-694 east and south to US 12. Take US 12 east. It will change to I-94 when you cross the St. Croix R.
7. Stay on I-94. A convenient rest area is about 20 miles south of Eau Claire. Use this as a checkpoint.
8. Continue on I-94 to Millston. Camp at Black River State Forest campground.
9. Mileage for second day approximately 465.

C. Third day:

1. Return to I-94, follow it south. It joins I-90 at Tomah.
2. Follow I-90, not I-94, when they split at Madison.
3. Buy lunch food at Janesville. There are two exits at Beloit, with a rest area between them on the Northbound side. Go to the second exit, get off and turn back north to the rest area. After lunch continue north a couple of miles to the other exit and again exit and return to I-90 going south. This is the only rest area for many miles that we know of.
4. Follow I-90, which becomes the Northwest Tollway, to I-294. Note: About 10 miles east of Elgin I-90 and the Tollway split. Either will get you to I-294 but I-90 is cheaper.
5. Proceed south on I-294, also called Tri-State Tollway, to junction with I-80 and I-94. Follow these numbers to junction with I-65, just over the Indiana state line.
6. Go south on I-65 to Lafayette. A rest stop at a service station just after getting onto I-65 may be needed to calm the drivers' nerves after negotiating Chicago traffic.
7. Exit from I-65 onto Indiana 25, headed north. In about 3 miles there is the Leasure Time campground. Enjoy

brief, warm showers. (the supply of hot water is very limited).

8. Mileage for third day approximately 400

D. Fourth day:

1. Return to I-65. Follow it south to junction with I-465.
2. Proceed east and south on I-465 to junction with I-70.
3. Go east on I-70 to first Richmond exit.
4. Proceed south on Williamsburg Pike to N.W. 5th Street and to Earlham. Arrive at Earlham by noon. Spend afternoon in clean up of equipment, vehicles and people.
5. Mileage for fourth day approximately 135.

Depending on your schedule, you may wish to camp one night at Jay Cook State Park, near Cloquet, Minnesota. Follow Minnesota 33 to I-35, go one exit south (2 miles) and exit to Minnesota 39. Follow 39 east. Signs will direct you to Jay Cook. Enjoy hot showers. This is about 190 miles from International Falls. In this case, the Baraboo area is a possibility for the following night, and then home to Earlham from there. We have not found a good campsite between Madison and Lafayette.

PROCEDURES IN EVENT OF SEPARATION OF VEHICLES

a. Separation constitutes failure to appear at a checkpoint or campground within one hour of arrival of caravan.

b. Detached vehicle(s) immediately proceed(s) to nearest state police division office ahead, contacts police with description and ID of other vehicles, message to establish contact.

c. Balance of caravan immediately after noting separation does likewise.

d. All vehicles proceed to next state police division office ahead, repeat effort to establish contact through police/or to learn whether missing vehicle(s) have been located, are in trouble, etc.

e. All vehicles rendezvous at evening's destination. None proceed beyond evening's destination. In event missing vehicle(s) is/are disabled, police may make contact with remainder at designated campsite for the night.

f. Should missing vehicle(s) or news of same not be forthcoming in evening, remainder of caravan will have a group meeting in evening to assess situation, determine a course of action consistent with these guidelines and acceptable expedition standards.

Guidelines

a. Under no circumstances should a vehicle go past a checkpoint without stopping.

b. In the event of separation, follow procedure exactly.

c. Each day before starting, drivers should go over day's itinerary together.

CHECK-IN PROCEDURE

Each student is responsible for the equipment he signed out on outfitting day. If part is missing, or damaged in excess of expected normal use, he is expected to pay replacement or repair costs. For the mountain program, where each person carries his own equipment all the time and sees to its care daily, this can be done very similarily to checkout, but in reverse order. However, in the water program, where all equipment is carried in group packs, it has seemed simpler to adopt the following procedures. All of each item is gathered together for each expedition and counted. If the total agrees with what was signed out no further check is made. If something is missing and responsibility is unknown (pot grips, for instance) the charge is split among the group. If it is a large item (sleeping bag) the numbers of the bags are checked against the sign out sheets until the missing one is identified. The latter procedure is rarely necessary.

Any equipment which students wish to purchase must be set aside at this point. Once it is stored away, it is no longer for sale.

After check-in is completed for any item, clean-up may proceed.

CLEAN-UP PROCEDURES

Cleaning up from a camping trip is just as much a part of it as the joys experienced in the wilderness. Students can be taught this and provide a very useful service at the same time by so organizing the return to campus that the preliminary clean-up is done immediately. This takes a bit of previous organizing by the leaders as well as preparing the students psychologically to expect it. It should not be presented as a disagreeable chore or requirement for release, but as an integral part of the whole experience. When presented in this way it is likely to turn into a rather satisfying time which caps the month's experience with a group effort that has visible results.

It is suggested that sometime before getting to campus, perhaps the evening before, the general procedure be explained and students be asked to sign up for the various tasks to be done. One of the leaders should be a general director of operations, the others helping out in the store rooms, and other places where their special

knowledge of locations of things on campus or equipment storage is needed. Each year's procedure will need to vary slightly due to time of arrival, weather, condition of equipment and other factors, but the following suggestions will serve as a general guide.

Approximate number of people	job description
6	Remove canoe yokes, install thwarts, take canoes and trailers to barn and store them and loosen shock cords. Store yokes in the water storeroom (water only.)
2	Dismantle and inventory the fishing kits.
4	Dry, brush clean, fold neatly and store in proper places: ground cloths, tarps, ponchos, canoe tarps, life jackets.
2	Wash billy bags, fry pan bags, stuff bags, mosquito netting, sleeping bag liners; dry and fold and put in store rooms.
2	Scrub stoves, empty fuel back into cans. Allow to dry, and store in water store room.
2	Sort food and return to original containers if feasible.
3-4	Clean cars thoroughly. Return to store room: ropes, paddles, helmets, car repair tools, canoe repair kits, maps, first aid kits. Dismantle various kits as needed.
4-6	Scrub spoons, bowls, fry pans and empty spice bottles. Sort filled spice bottles by type and arrange in store room.
2	Remove dirty packs from frame and wash (mountain only)

Some of these jobs can't start until others are finished and others finish early. Flexibility should be the rule. Some jobs, i.e., taking sleeping bags to the store room, are not even listed. It is the instructor's role to see that people do what is needed when it is needed. Approached this way the whole job need only take 3 or 4 hours. If it is evident that there will be plenty of extra time some other jobs can be done at this time, such as:

replacing tarp tie cords as needed
sorting stuff bags, liners, life jackets etc. that need repairs
possibly sanding paddles that have developed rough places.

Sleeping bags must be commercially washed, so can be heaped in a big pile on the floor in an out of the way place.